RF Test Report

For

Applicant Name:	Shenzhen United online Technology Co.,LTD
Address:	201, Building 3, No. 78 Shahe Road, Yuanshan Street, Longgang District, Shenzhen
EUT Name:	Smart glasses
Brand Name:	N/A
Model Number:	J1
Series Model Number:	J2, J3, J5, J6, J8, J9, J10

Issued By

Company Name:	**BTF Testing Lab (Shenzhen) Co., Ltd.**
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Report Number:	BTF230717R01301
Test Standards:	47 CFR Part 15.247
Test Conclusion:	Pass
FCC ID:	2BB7C-J1
Test Date:	2023-07-10 to 2023-07-20
Date of Issue:	2023-07-20
Prepared By:	Elma.yang / Project Engineer
Date:	2023-07-20
Approved By:	Ryan.CJ / EMC Manager
Date:	2023-07-20

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Revision History		
Version	Issue Date	Revisions Content
R_V0	2023-07-20	Original
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1 Introduction

1.1 Identification of Testing Laboratory

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130

1.2 Identification of the Responsible Testing Location

Company Name:	BTF Testing Lab (Shenzhen) Co., Ltd.
Address:	F101, 201 and 301, Building 1, Block 2, Tantou Industrial Park, Tantou Community, Songgang Street, Bao'an District, Shenzhen, China
Phone Number:	+86-0755-23146130
Fax Number:	+86-0755-23146130
FCC Registration Number:	518915
Designation Number:	CN1330

1.3 Announcement

(1) The test report reference to the report template version v0.
(2) The test report is invalid if not marked with the signatures of the persons responsible for preparing, reviewing and approving the test report.
(3) The test report is invalid if there is any evidence and/or falsification.
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2 Product Information

2.1 Application Information

Company Name:	Shenzhen United online Technology Co.,LTD
Address:	201, Building 3, No. 78 Shahe Road, Yuanshan Street, Longgang District, Shenzhen

2.2 Manufacturer Information

Company Name:	Shenzhen United online Technology Co.,LTD
Address:	201, Building 3, No. 78 Shahe Road, Yuanshan Street, Longgang District, Shenzhen

2.3 General Description of Equipment under Test (EUT)

EUT Name:	Smart glasses
Test Model Number:	J1
Series Model Number:	J2, J3, J5, J6, J8, J9, J10
Difference:	All the same except the model and the colour.

2.4 Technical Information

Power Supply:	DC 3.7V from Battery
Power Adaptor:	Model number：KS-0502000U Input：AC 100-240V 50/60Hz 0.35A Max Output: DC 5V/2A
Operation Frequency:	2402MHz to 2480MHz
Number of Channels:	40
Modulation Type:	GFSK
Antenna Type:	Internal ANT
Antenna Gain#:	2 dBi

Note:

#: The antenna gain provided by the applicant, and the laboratory will not be responsible for the accumulated calculation results which covers the information provided by the applicant.

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3 Summary of Test Results

3.1 Test Standards

The tests were performed according to following standards:
47 CFR Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

3.2 Uncertainty of Test

Item	Measurement Uncertainty
Conducted Emission (150 kHz-30 MHz)	±2.64dB
The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3.3 Summary of Test Result

Item	Standard	Requirement	Result
Antenna requirement	47 CFR Part 15.247	Part 15.203	Pass
Conducted Emission at AC power line	47 CFR Part 15.247	47 CFR 15.207(a)	Pass
Occupied Bandwidth	47 CFR Part 15.247	47 CFR 15.247(a)(2)	Pass
Maximum Conducted Output Power	47 CFR Part 15.247	47 CFR 15.247(b)(3)	Pass
Power Spectral Density	47 CFR Part 15.247	47 CFR 15.247(e)	Pass
Emissions in non-restricted frequency bands	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Band edge emissions (Radiated)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (below 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass
Emissions in restricted frequency bands (above 1GHz)	47 CFR Part 15.247	47 CFR 15.247(d)	Pass

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4 Test Configuration

4.1 Test Equipment List

Conducted Emission at AC power line					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Pulse Limiter	SCHWARZBECK	VTSD 9561-F	00953	2022-11-24	2023-11-23
Coaxial Switcher	SCHWARZBECK	CX210	CX210	2022-11-24	2023-11-23
V-LISN	SCHWARZBECK	NSLK 8127	01073	2022-11-24	2023-11-23
LISN	AFJ	LS16/110VAC	16010020076	2023-02-23	2024-02-22
EMI Receiver	ROHDE&SCHWARZ	ESCI3	101422	2022-11-24	2023-11-23

Occupied Bandwidth					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
RFTest software	/	V1.00	/	/	/
RF Control Unit	Techy	TR1029-1	/	2022-11-24	2023-11-23
RF Sensor Unit	Techy	TR1029-2	/	2022-11-24	2023-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2022-11-24	2023-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2022-11-24	2023-11-23
WIDEBAND RADIO COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Maximum Conducted Output Power					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
RFTest software	/	V1.00	/	/	/
RF Control Unit	Techy	TR1029-1	/	2022-11-24	2023-11-23
RF Sensor Unit	Techy	TR1029-2	/	2022-11-24	2023-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2022-11-24	2023-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2022-11-24	2023-11-23
WIDEBAND RADIO COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Power Spectral Density					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**

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RFTest software	/	V1.00	/	/	/
RF Control Unit	Techy	TR1029-1	/	2022-11-24	2023-11-23
RF Sensor Unit	Techy	TR1029-2	/	2022-11-24	2023-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2022-11-24	2023-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2022-11-24	2023-11-23
WIDEBAND RADIO COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Emissions in non-restricted frequency bands					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
RFTest software	/	V1.00	/	/	/
RF Control Unit	Techy	TR1029-1	/	2022-11-24	2023-11-23
RF Sensor Unit	Techy	TR1029-2	/	2022-11-24	2023-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2022-11-24	2023-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2022-11-24	2023-11-23
WIDEBAND RADIO COMMNUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2022-11-24	2023-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2022-11-24	2023-11-23

Band edge emissions (Radiated)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2023-03-24	2024-03-23
Preamplifier	SCHWARZBECK	BBV9744	00246	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-10m	21101566	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1m	21101568	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2021-11-28	2023-11-27
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI7	101032	2022-11-24	2023-11-23

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SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplilifier	SCHWARZBECK	BBV9718D	00008	2023-03-24	2024-03-23
Horn Antenna	SCHWARZBECK	BBHA9120D	2597	2022-05-22	2024-05-21
EZ_EMC	Frad	FA-03A2 RE+	/	/	/
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2021-11-28	2023-11-27

Emissions in restricted frequency bands (below 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2023-03-24	2024-03-23
Preamplifier	SCHWARZBECK	BBV9744	00246	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-10m	21101566	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1m	21101568	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2021-11-28	2023-11-27
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI7	101032	2022-11-24	2023-11-23
SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplilifier	SCHWARZBECK	BBV9718D	00008	2023-03-24	2024-03-23
Horn Antenna	SCHWARZBECK	BBHA9120D	2597	2022-05-22	2024-05-21
EZ_EMC	Frad	FA-03A2 RE+	/	/	/
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2021-11-28	2023-11-27

Emissions in restricted frequency bands (above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Coaxial cable Multiflex 141	Schwarzbeck	N/SMA 0.5m	517386	2023-03-24	2024-03-23
Preamplifier	SCHWARZBECK	BBV9744	00246	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-10m	21101566	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1m	21101568	2022-11-24	2023-11-23

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RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2022-11-24	2023-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2021-11-28	2023-11-27
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI7	101032	2022-11-24	2023-11-23
SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2022-11-24	2023-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplilifier	SCHWARZBECK	BBV9718D	00008	2023-03-24	2024-03-23
Horn Antenna	SCHWARZBECK	BBHA9120D	2597	2022-05-22	2024-05-21
EZ_EMC	Frad	FA-03A2 RE+	/	/	/
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Log periodic antenna	SCHWARZBECK	VULB 9168	01328	2021-11-28	2023-11-27

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4.2 Test Auxiliary Equipment

The EUT was tested as an independent device.

4.3 Test Modes

No.	Test Modes	Description
TM1	TX mode	Keep the EUT in continuously transmitting mode with GFSK modulation.

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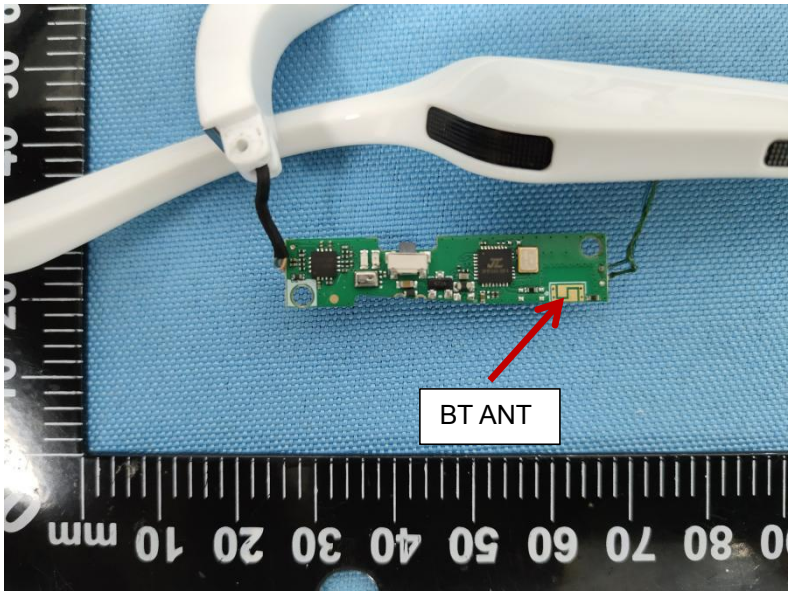
5 Evaluation Results (Evaluation)

5.1 Antenna requirement

Test Requirement:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

5.1.1 Conclusion:



6 Radio Spectrum Matter Test Results (RF)

6.1 Conducted Emission at AC power line

Test Requirement:	Except as shown in paragraphs (b)and (c)of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).
Test Method:	Refer to ANSI C63.10-2013 section 6.2, standard test method for ac power-line conducted emissions from unlicensed wireless devices
Test Limit:	

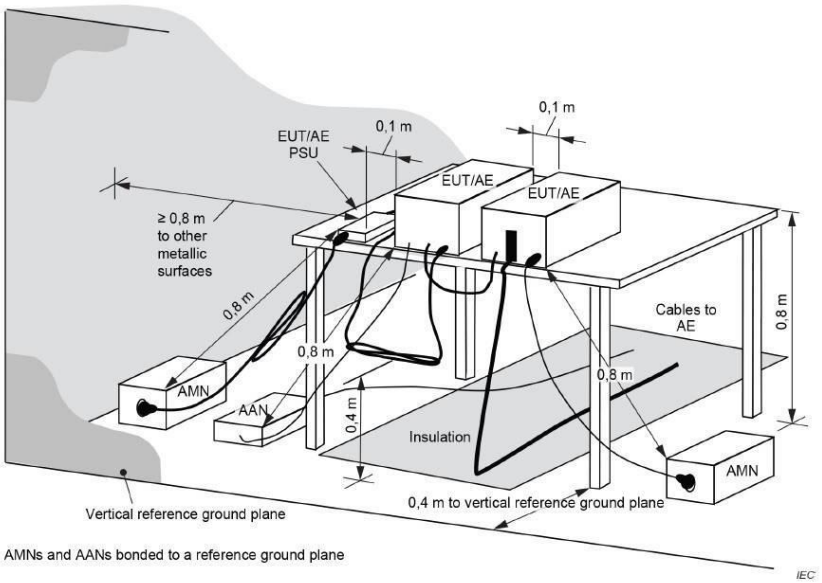
Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

6.1.1 E.U.T. Operation:

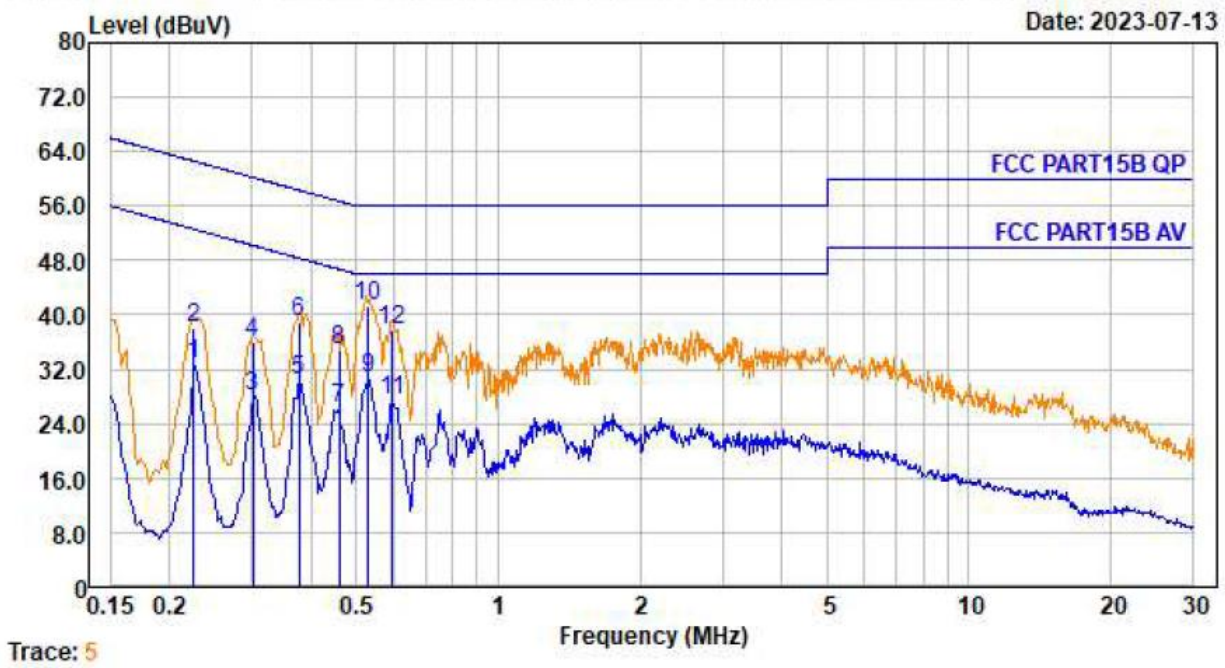
Operating Environment:	
Temperature:	25.2 °C
Humidity:	50.5 %
Atmospheric Pressure:	1010 mbar

6.1.2 Test Setup Diagram:



6.1.3 Test Data:

TM1 / Line: Line / Band: 2.4G / BW: 1 / CH: M



No.	Freq MHz	Cable Loss dB	LISN Factor dB/m	Receiver Reading dBuV	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	0.226	0.01	9.55	23.35	32.91	52.61	-19.70	Average
2.	0.226	0.01	9.55	28.60	38.16	62.61	-24.45	QP
3.	0.302	0.01	9.56	18.55	28.12	50.19	-22.07	Average
4.	0.302	0.01	9.56	26.31	35.88	60.19	-24.31	QP
5.	0.377	0.01	9.56	20.78	30.35	48.34	-17.99	Average
6.	0.377	0.01	9.56	29.50	39.07	58.34	-19.27	QP
7.	0.459	0.01	9.57	16.61	26.19	46.71	-20.52	Average
8.	0.459	0.01	9.57	25.28	34.86	56.71	-21.85	QP
9.	0.529	0.01	9.57	21.26	30.84	46.00	-15.16	Average
10.	0.529	0.01	9.57	31.73	41.31	56.00	-14.69	QP
11.	0.595	0.02	9.58	17.85	27.45	46.00	-18.55	Average
12.	0.595	0.02	9.58	28.14	37.74	56.00	-18.26	QP

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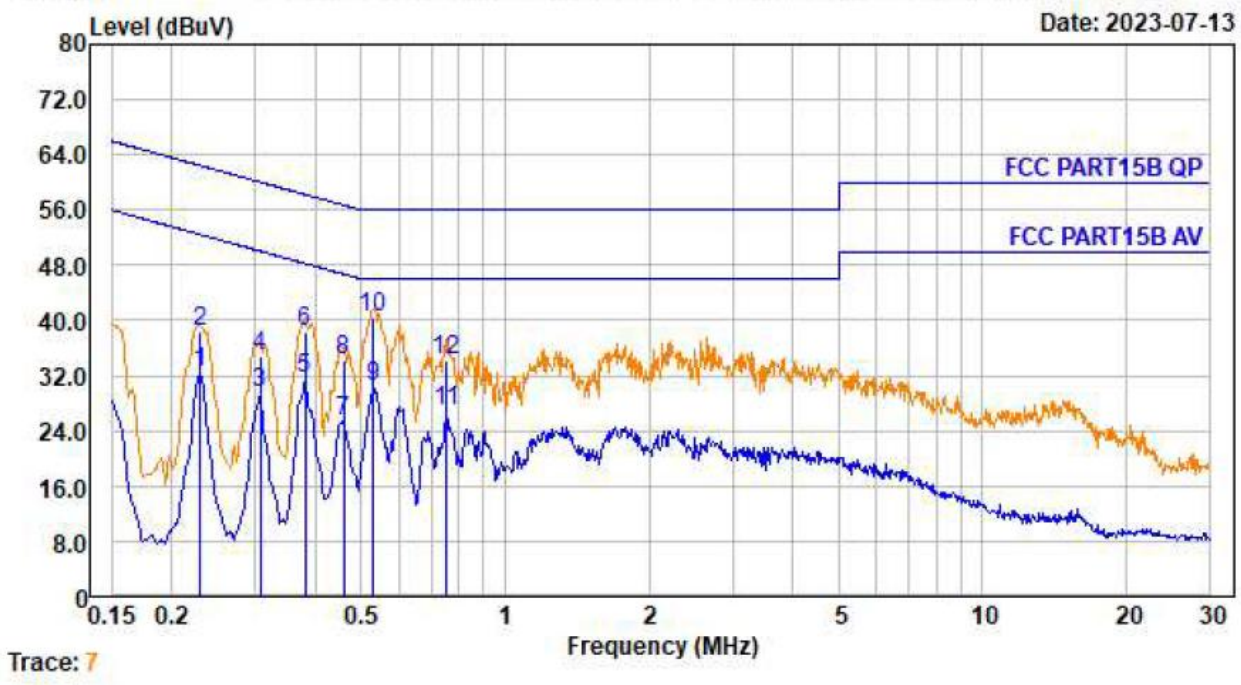
TM1 / Line: Neutral / Band: 2.4G / BW: 1 / CH: M



No.	Freq MHz	Cable Loss dB	LISN Factor dB/m	Receiver Reading dBuV	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	0.230	0.01	9.55	23.01	32.57	52.44	-19.87	Average
2.	0.230	0.01	9.55	28.70	38.26	62.44	-24.18	QP
3.	0.307	0.01	9.56	19.90	29.47	50.06	-20.59	Average
4.	0.307	0.01	9.56	25.28	34.85	60.06	-25.21	QP
5.	0.381	0.01	9.57	21.97	31.55	48.25	-16.70	Average
6.	0.381	0.01	9.57	28.82	38.40	58.25	-19.85	QP
7.	0.459	0.01	9.58	15.93	25.52	46.71	-21.19	Average
8.	0.459	0.01	9.58	24.76	34.35	56.71	-22.36	QP
9.	0.529	0.01	9.58	20.96	30.55	46.00	-15.45	Average
10.	0.529	0.01	9.58	30.79	40.38	56.00	-15.62	QP
11.	0.755	0.02	9.58	17.23	26.83	46.00	-19.17	Average
12.	0.755	0.02	9.58	24.62	34.22	56.00	-21.78	QP

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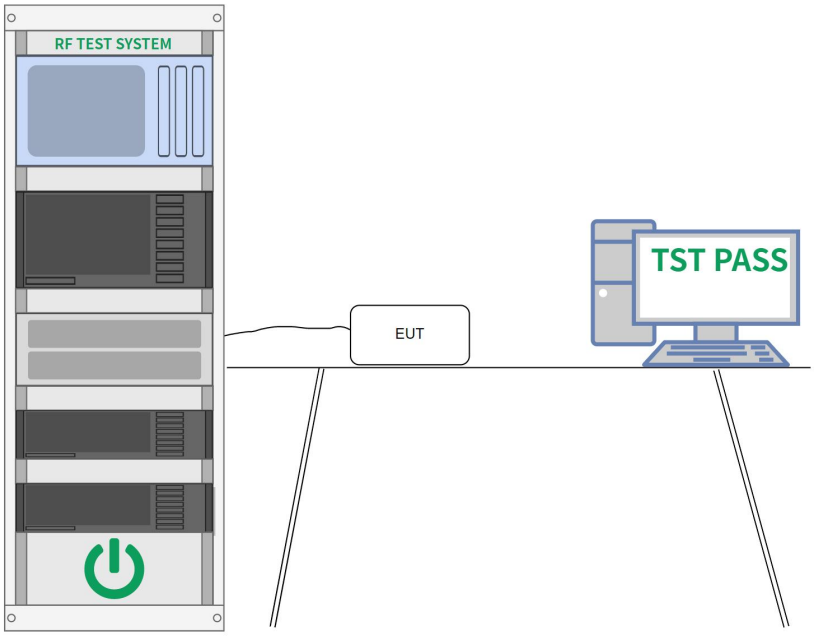
6.2 Occupied Bandwidth

Test Requirement:	Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Test Method:	DTS bandwidth
Test Limit:	Section (a)(2), Systems using digital modulation techniques may operate in the 902-928 MHz, and 2400-2483.5 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.
Procedure:	a) Set RBW = 100 kHz. b) Set the VBW >= [3 × RBW]. c) Detector = peak. d) Trace mode = max hold. e) Sweep = auto couple. f) Allow the trace to stabilize. g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

6.2.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

6.2.2 Test Setup Diagram:



6.2.3 Test Data:

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6.3 Maximum Conducted Output Power

Test Requirement:	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Test Method:	Maximum peak conducted output power
Test Limit:	For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.
Procedure:	ANSI C63.10-2013, section 11.9.1 Maximum peak conducted output power

6.3.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

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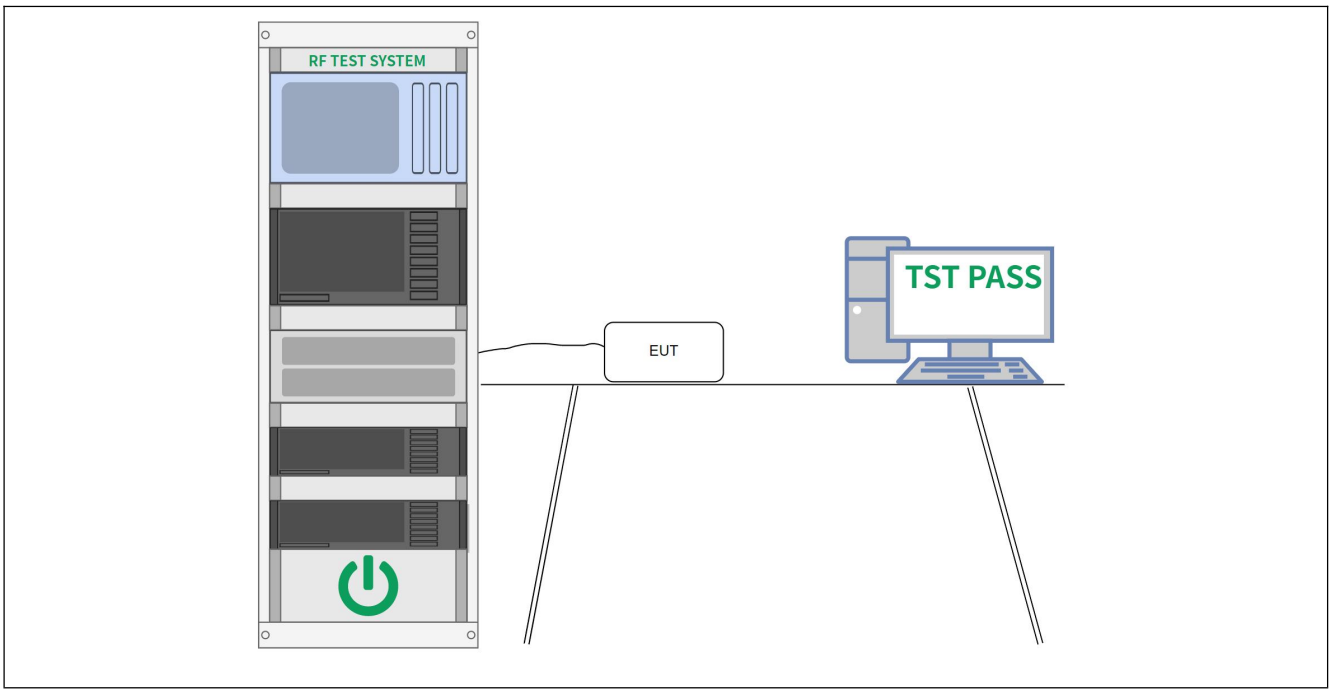
6.3.2 Test Setup Diagram:



6.3.3 Test Data:

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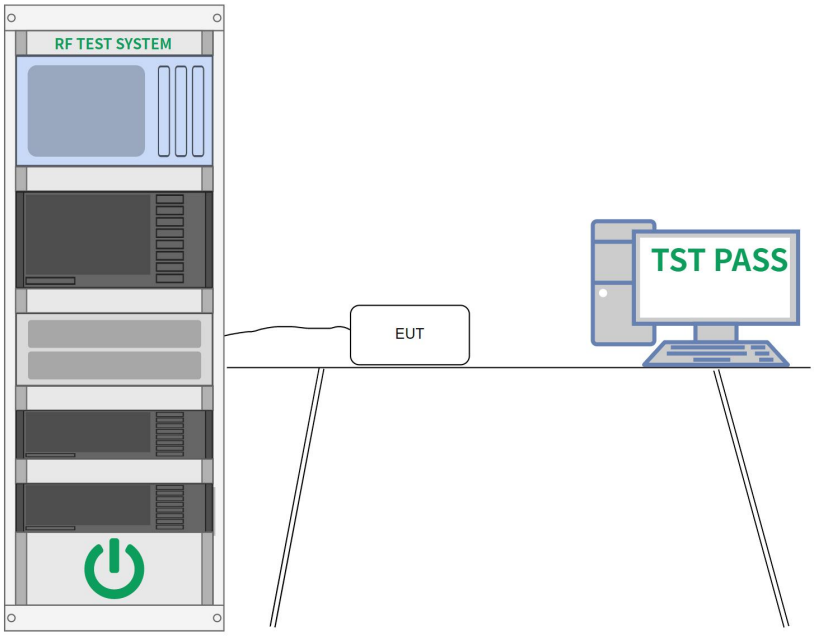
6.4 Power Spectral Density

Test Requirement:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.
Test Method:	Maximum power spectral density level in the fundamental emission
Test Limit:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

6.4.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

6.4.2 Test Setup Diagram:



6.4.3 Test Data:

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6.5 Emissions in non-restricted frequency bands

Test Requirement:	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.
Test Method:	Emissions in nonrestricted frequency bands
Test 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.
Procedure:	ANSI C63.10-2013 Section 11.11.1, Section 11.11.2, Section 11.11.3

6.5.1 E.U.T. Operation:

Operating Environment:	
Temperature:	25.8 °C
Humidity:	49.9 %
Atmospheric Pressure:	1010 mbar

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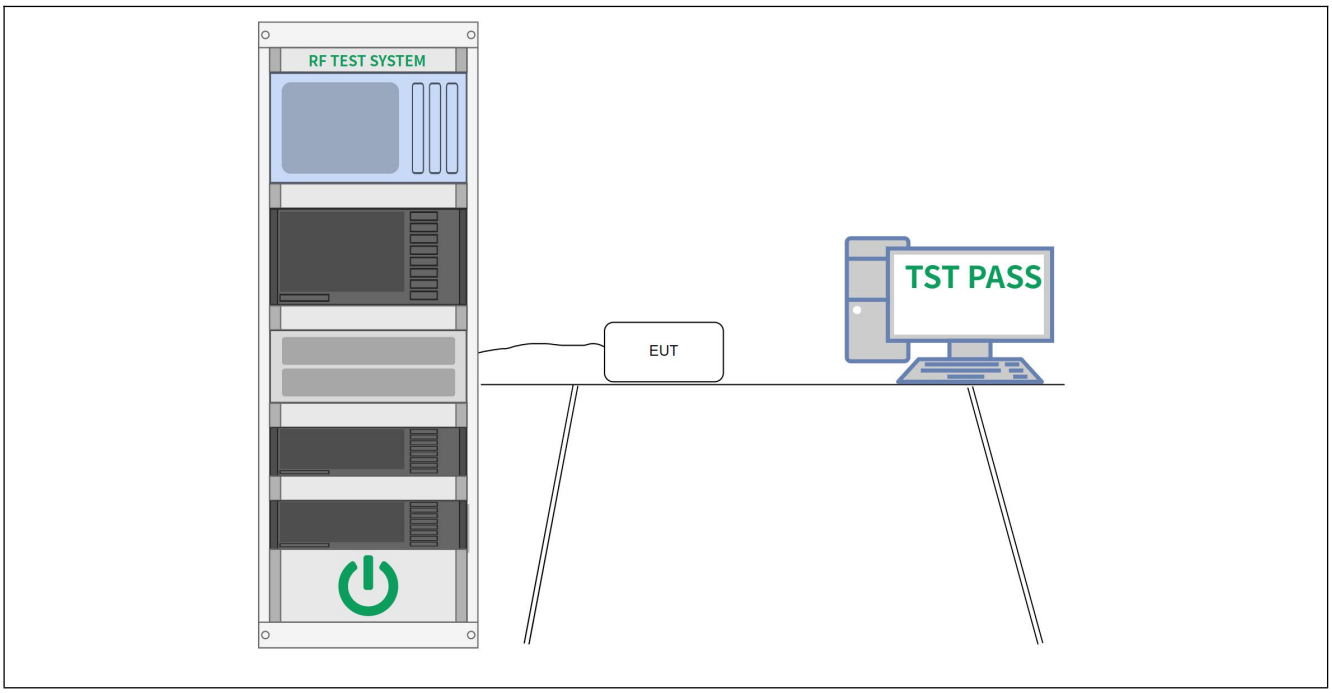
6.5.2 Test Setup Diagram:



6.5.3 Test Data:

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6.6 Band edge emissions (Radiated)

Test Requirement:	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)).`
Test Method:	Radiated emissions tests
Test 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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

Procedure:	ANSI C63.10-2013 section 6.6.4

6.6.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.1 °C
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar

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6.6.2 Test Data:

	Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission level (dBuV/m)	Limit (dBuV /m)	Detector Type	Result
GFSK	Low Channel: 2402MHz									
	H	2390.00	56.03	30.22	4.85	23.98	54.64	74.00	PK	PASS
	H	2390.00	48.19	30.22	4.85	23.98	46.80	54.00	AV	PASS
	H	2400.00	54.48	30.22	4.85	23.98	53.09	74.00	PK	PASS
	H	2400.00	44.98	30.22	4.85	23.98	43.59	54.00	AV	PASS
	V	2390.00	55.53	30.22	4.85	23.98	54.14	74.00	PK	PASS
	V	2390.00	46.28	30.22	4.85	23.98	44.89	54.00	AV	PASS
	V	2400.00	55.95	30.22	4.85	23.98	54.56	74.00	PK	PASS
	V	2400.00	47.10	30.22	4.85	23.98	45.71	54.00	AV	PASS
	High Channel: 2480MHz									
	H	2483.50	54.57	30.22	4.85	23.98	53.18	74.00	PK	PASS
	H	2483.50	46.72	30.22	4.85	23.98	45.33	54.00	AV	PASS
	H	2500.00	53.88	30.22	4.85	23.98	52.49	74.00	PK	PASS
	H	2500.00	47.22	30.22	4.85	23.98	45.83	54.00	AV	PASS
	V	2483.50	57.91	30.22	4.85	23.98	56.52	74.00	PK	PASS
	V	2483.50	47.91	30.22	4.85	23.98	46.52	54.00	AV	PASS
	V	2500.00	57.36	30.22	4.85	23.98	55.97	74.00	PK	PASS
	V	2500.00	48.08	30.22	4.85	23.98	46.69	54.00	AV	PASS

Remark:
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit

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6.7 Emissions in restricted frequency bands (below 1GHz)

Test Requirement:	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)).`
Test Method:	Radiated emissions tests
Test 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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

Procedure:	ANSI C63.10-2013 section 6.6.4

6.7.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.1 °C
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar

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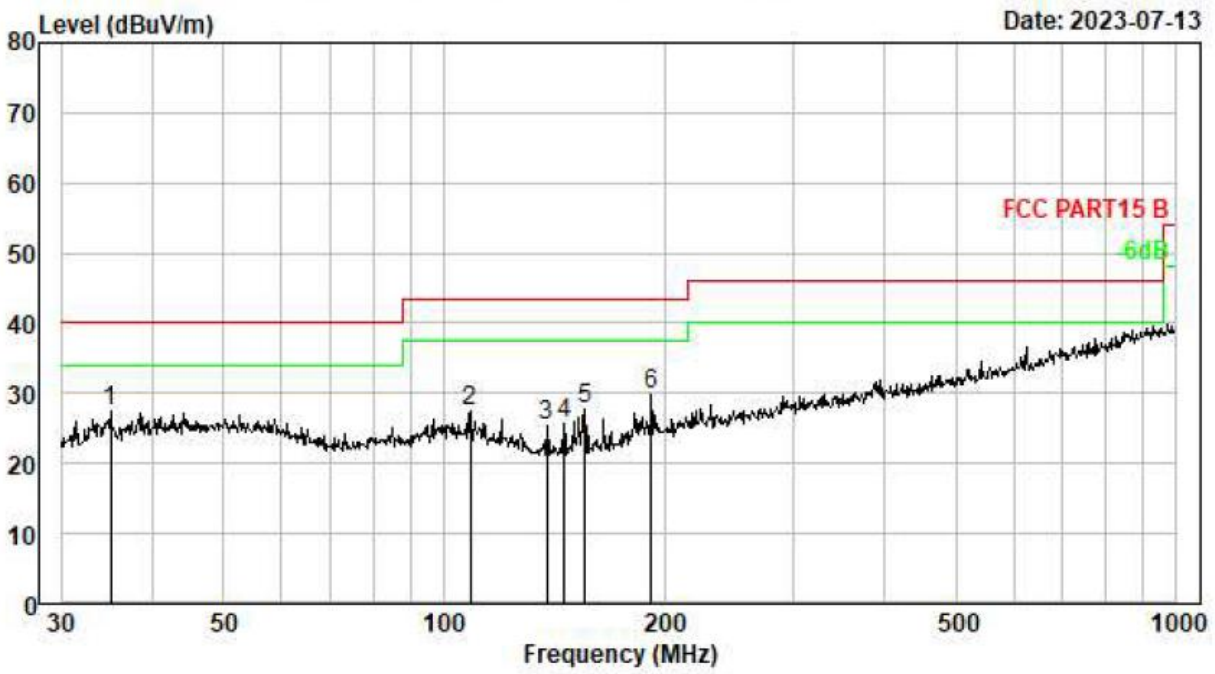
6.7.2 Test Data:

Note: All the mode have been tested, and only the worst case of 1M mode are in the report
TM1 / Polarization: Horizontal / Band: 2.4G / BW: 1 / CH: H



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBμV	Emission Level dBμV/m	Limit dBμV/m	Over Limit dB	Remark
1	35.005	0.30	11.16	16.12	27.58	40.00	-12.42	QP
2	108.647	0.73	11.19	15.46	27.38	43.50	-16.12	QP
3	138.387	0.86	8.59	16.07	25.52	43.50	-17.98	QP
4	145.861	0.89	8.38	16.42	25.69	43.50	-17.81	QP
5	155.910	0.93	8.60	18.07	27.60	43.50	-15.90	QP
6	191.745	1.04	11.15	17.55	29.74	43.50	-13.76	QP

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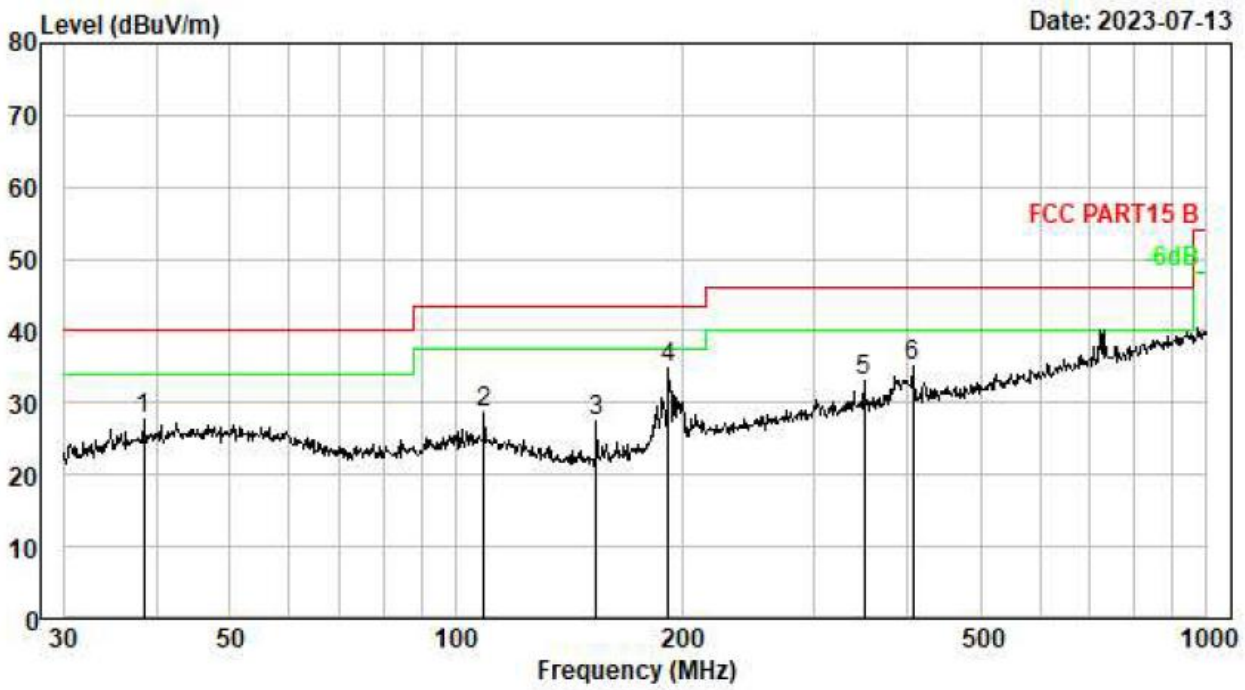
TM1 / Polarization: Vertical / Band: 2.4G / BW: 1 / CH: H



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBµV	Emission Level dBµV/m	Limit dBµV/m	Over Limit dB	Remark
1	38.346	0.33	12.07	15.25	27.65	40.00	-12.35	QP
2	109.029	0.74	11.19	16.69	28.62	43.50	-14.88	QP
3	153.739	0.92	8.49	18.16	27.57	43.50	-15.93	QP
4	191.745	1.04	11.15	22.72	34.91	43.50	-8.59	QP
5	350.477	1.36	15.11	16.56	33.03	46.00	-12.97	QP
6	406.088	1.44	15.89	17.72	35.05	46.00	-10.95	QP

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6.8 Emissions in restricted frequency bands (above 1GHz)

Test Requirement:	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)).`
Test Method:	Radiated emissions tests
Test 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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

Procedure:	ANSI C63.10-2013 section 6.6.4

6.8.1 E.U.T. Operation:

Operating Environment:	
Temperature:	22.1 °C
Humidity:	46.3 %
Atmospheric Pressure:	1010 mbar

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6.8.2 Test Data:

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Low Channel:2402MHz									
V	4804.00	50.21	30.55	5.77	24.66	50.09	74.00	-23.91	Pk
V	4804.00	40.52	30.55	5.77	24.66	40.40	54.00	-13.60	AV
V	7206.00	48.60	30.33	6.32	24.55	49.14	74.00	-24.86	Pk
V	7206.00	41.25	30.33	6.32	24.55	41.79	54.00	-12.21	AV
V	9608.00	48.26	30.85	7.45	24.69	49.55	74.00	-24.45	Pk
V	9608.00	40.03	30.85	7.45	24.69	41.32	54.00	-12.68	AV
V	12010.00	48.25	31.02	8.99	25.57	51.79	74.00	-22.21	Pk
V	12010.00	38.35	31.02	8.99	25.57	41.89	54.00	-12.11	AV
H	4804.00	51.13	30.55	5.77	24.66	51.01	74.00	-22.99	Pk
H	4804.00	41.20	30.55	5.77	24.66	41.08	54.00	-12.92	AV
H	7206.00	49.68	30.33	6.32	24.55	50.22	74.00	-23.78	Pk
H	7206.00	41.41	30.33	6.32	24.55	41.95	54.00	-12.05	AV
H	9608.00	50.04	30.85	7.45	24.69	51.33	74.00	-22.67	Pk
H	9608.00	40.61	30.85	7.45	24.69	41.90	54.00	-12.10	AV
H	12010.00	49.82	31.02	8.99	25.57	53.36	74.00	-20.64	Pk
H	12010.00	39.22	31.02	8.99	25.57	42.76	54.00	-11.24	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
Middle Channel:2440MHz									
V	4880.00	48.53	30.55	5.77	24.66	48.41	74.00	-25.59	Pk
V	4880.00	39.21	30.55	5.77	24.66	39.09	54.00	-14.91	AV
V	7320.00	47.36	30.33	6.32	24.55	47.90	74.00	-26.10	Pk
V	7320.00	41.04	30.33	6.32	24.55	41.58	54.00	-12.42	AV
V	9760.00	46.55	30.85	7.45	24.69	47.84	74.00	-26.16	Pk
V	9760.00	39.20	30.85	7.45	24.69	40.49	54.00	-13.51	AV
V	12200.00	46.69	31.02	8.99	25.57	50.23	74.00	-23.77	Pk
V	12200.00	37.36	31.02	8.99	25.57	40.90	54.00	-13.10	AV
H	4880.00	49.99	30.55	5.77	24.66	49.87	74.00	-24.13	Pk
H	4880.00	39.73	30.55	5.77	24.66	39.61	54.00	-14.39	AV
H	7320.00	48.53	30.33	6.32	24.55	49.07	74.00	-24.93	Pk
H	7320.00	38.70	30.33	6.32	24.55	39.24	54.00	-14.76	AV
H	9760.00	48.96	30.85	7.45	24.69	50.25	74.00	-23.75	Pk
H	9760.00	40.37	30.85	7.45	24.69	41.66	54.00	-12.34	AV
H	12200.00	48.47	31.02	8.99	25.57	52.01	74.00	-21.99	Pk
H	12200.00	38.40	31.02	8.99	25.57	41.94	54.00	-12.06	AV

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Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
High Channel:2480MHz									
V	4960.00	49.27	30.55	5.77	24.66	49.15	74.00	-24.85	Pk
V	4960.00	38.65	30.55	5.77	24.66	38.53	54.00	-15.47	AV
V	7440.00	46.99	30.33	6.32	24.55	47.53	74.00	-26.47	Pk
V	7440.00	41.19	30.33	6.32	24.55	41.73	54.00	-12.27	AV
V	9920.00	47.52	30.85	7.45	24.69	48.81	74.00	-25.19	Pk
V	9920.00	39.46	30.85	7.45	24.69	40.75	54.00	-13.25	AV
V	12400.00	46.69	31.02	8.99	25.57	50.23	74.00	-23.77	Pk
V	12400.00	37.35	31.02	8.99	25.57	40.89	54.00	-13.11	AV
H	4960.00	49.41	30.55	5.77	24.66	49.29	74.00	-24.71	Pk
H	4960.00	39.96	30.55	5.77	24.66	39.84	54.00	-14.16	AV
H	7440.00	48.18	30.33	6.32	24.55	48.72	74.00	-25.28	Pk
H	7440.00	40.56	30.33	6.32	24.55	41.10	54.00	-12.90	AV
H	9920.00	48.26	30.85	7.45	24.69	49.55	74.00	-24.45	Pk
H	9920.00	39.71	30.85	7.45	24.69	41.00	54.00	-13.00	AV
H	12400.00	49.98	31.02	8.99	25.57	53.52	74.00	-20.48	Pk
H	12400.00	37.93	31.02	8.99	25.57	41.47	54.00	-12.53	AV

Remark:
1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,
   Margin= Emission Level - Limit
2. If peak below the average limit, the average emission was no test.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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7 Test Setup Photos

Please see the attachment for the test setup photos.

8 EUT Constructional Details (EUT Photos)

Please see the attachment for the EUT photos.

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Appendix

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2. Bandwidth

2.1 6dB BW

2.1.1 Test Result

Test channel	Channel Bandwidth (KHz)	Limit(KHz)	Result
Lowest	507.59	>500	Pass
Middle	505.82		
Highest	509.80		

2.2.2 Test Graph

CH 01

CH20

CH40

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3. Maximum Conducted Output Power

3.1 Test Result

Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	-1.34	30.00	Pass
Middle	-2.12		
Highest	-2.35		

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4. Maximum Power Spectral Density

4.1 PSD

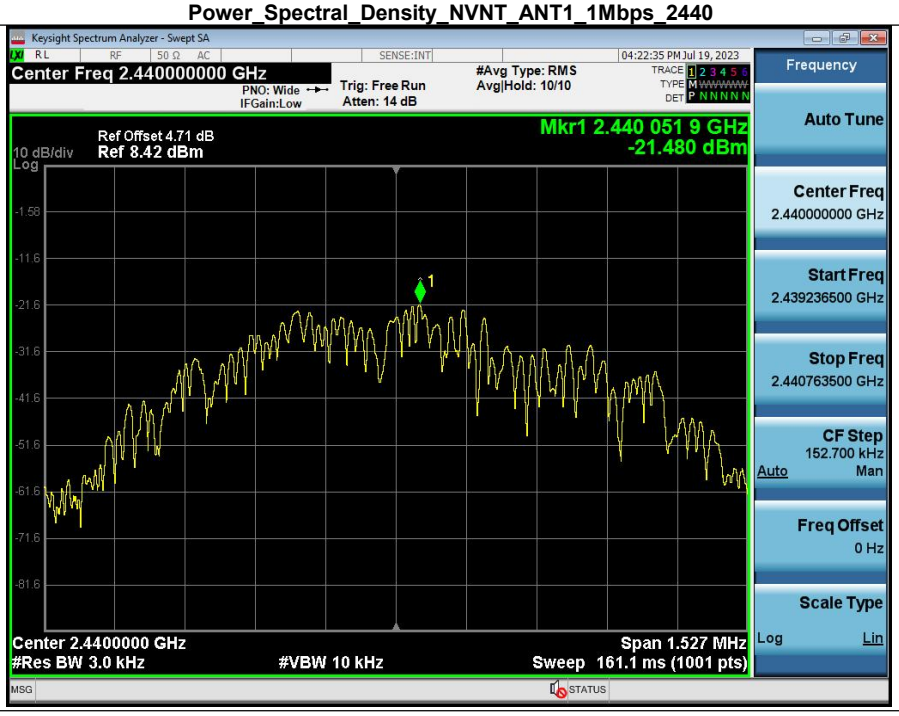
4.1.1 Test Result

Frequency	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)	Result
2402 MHz	-20.41	8	PASS
2440 MHz	-21.48	8	PASS
2480 MHz	-21.97	8	PASS

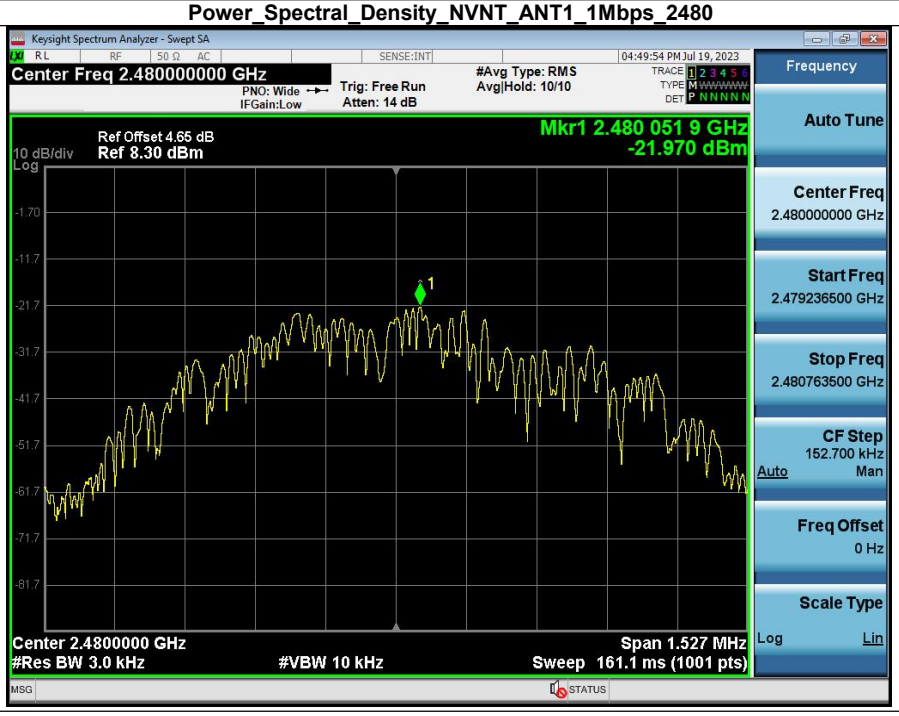
4.1.2 Test Graph

Power_Spectral_Density_NVNT_ANT1_1Mbps_2402

Power_Spectral_Density_NVNT_ANT1_1Mbps_2440



Power_Spectral_Density_NVNT_ANT1_1Mbps_2480



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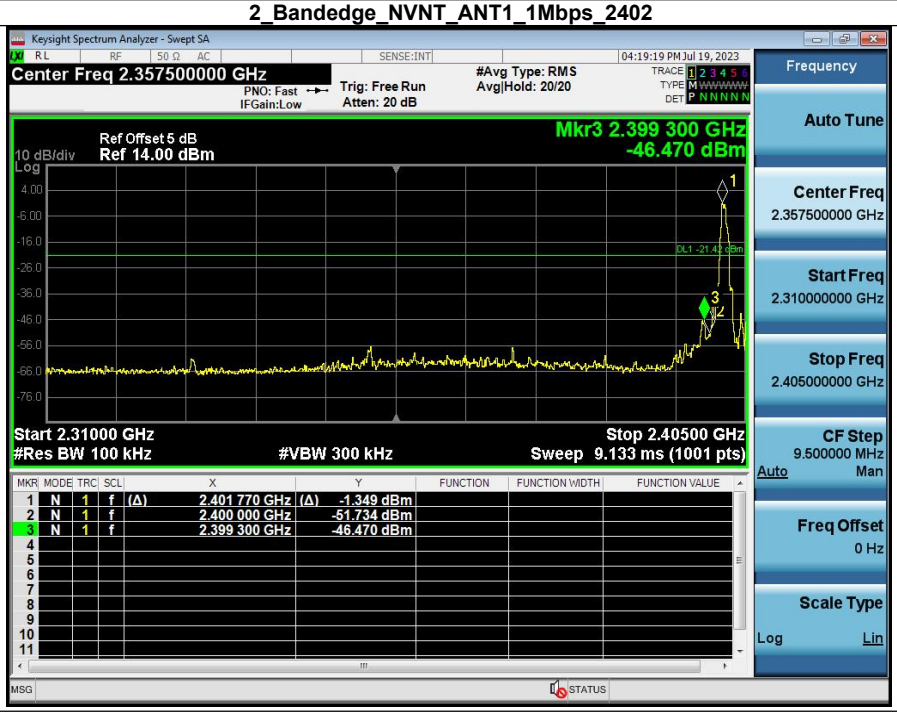
5. Unwanted Emissions In Non-restricted Frequency Bands

5.1 Test Result

1_Reference_Level_NVNT_ANT1_1Mbps_2402

2_Bandedge_NVNT_ANT1_1Mbps_2402



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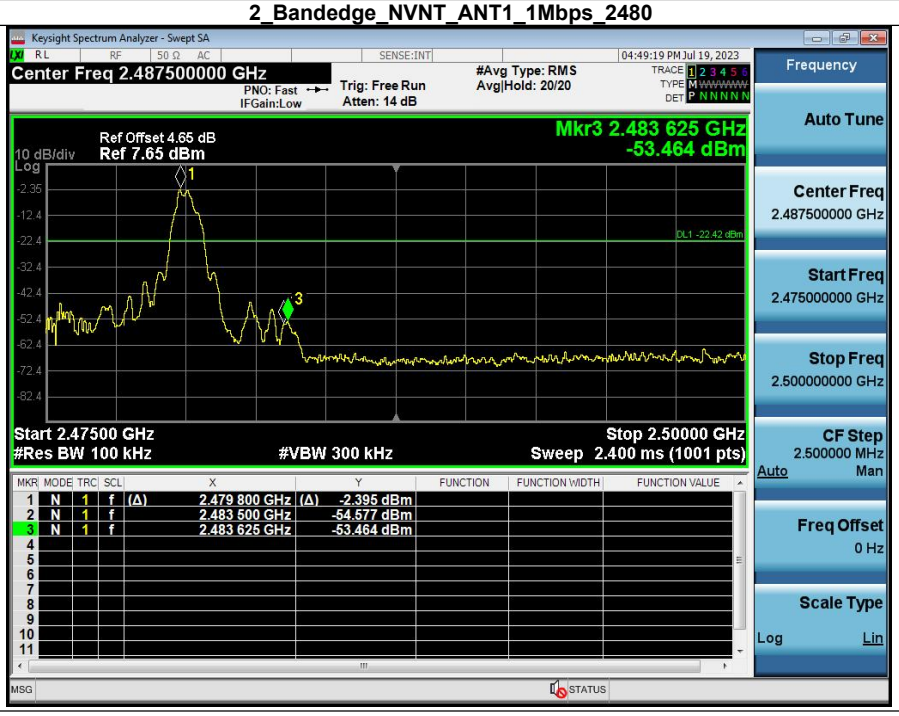
1_Reference_Level_NVNT_ANT1_1Mbps_2480

2_Bandedge_NVNT_ANT1_1Mbps_2480



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