



RF Test Report

For

Applicant Name: Faurecia clarion electronics Europe
Address: Batiment Lumière – 40 Avenue des Terroirs de France, 75012 Paris – France
EUT Name: IN Vehicle Infotainment
Brand Name: Faurecia
Model Number: Crony 2
Series Model Number: Refer to section 2

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: BTF240125R00501
Test Standards: 47 CFR Part 15.247

Test Conclusion: Pass
FCC ID: 2BEZMCRONY2
Test Date: 2024-01-14 to 2024-01-25
Date of Issue: 2024-01-25

Prepared By:

Chris Liu / Project Engineer
2024-01-25

Approved By:

Ryan.CJ / EMC Manager
2024-01-25

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Test Report Number: BTF240125R00501

Revision History		
Version	Issue Date	Revisions Content
R_V0	2024-01-25	Original
<i>Note: Once the revision has been made, then previous versions reports are invalid.</i>		

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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.
- (4) This document may not be altered or revised in any way unless done so by BTF and all revisions are duly noted in the revisions section.
- (5) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
- (6) The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

2 Product Information

2.1 Application Information

Company Name:	Faurecia clarion electronics Europe
Address:	Batiment Lumière – 40 Avenue des Terroirs de France, 75012 Paris – France

2.2 Manufacturer Information

Company Name:	Clarion Hungary electronics KFT.
Address:	Jászberényi út 116, 2760 Nagykáta - Hungary

2.3 Factory Information

Company Name:	Clarion Hungary electronics KFT.
Address:	Jászberényi út 116, 2760 Nagykáta - Hungary

2.4 General Description of Equipment under Test (EUT)

EUT Name:	IN Vehicle Infotainment
Test Model Number:	Crony 2
Series Model Number:	/
Description of Model name differentiation:	/
Hardware Version:	HW05
Software Version:	3.13.0

2.5 Technical Information

Power Supply:	DC 12V from Battery
Operation Frequency:	2402MHz to 2480MHz
Number of Channels:	40
Modulation Type:	GFSK
Antenna Type:	Monopole antenna
Antenna Gain#:	1dBi

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.

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 Test	2.56dB
Occupied Channel Bandwidth	69 KHz
All emissions, radiated(<1GHz)	4.12 dB
All emissions, radiated(>1GHz)	4.89dB
Temperature	0.82 °C
Humidity	4.1 %

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)	N/A
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

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	2023-11-24	2024-11-23
Coaxial Switcher	SCHWARZBECK	CX210	CX210	2023-11-24	2024-11-23
V-LISN	SCHWARZBECK	NSLK 8127	01073	2023-11-24	2024-11-23
LISN	AFJ	LS16/110VAC	16010020076	2023-02-23	2024-02-22
EMI Receiver	ROHDE&SCHWARZ	ESCI3	101422	2023-11-24	2024-11-23

Occupied Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RFTest software	/	V1.00	/	/	/
RF Control Unit	Techy	TR1029-1	/	2023-11-24	2024-11-23
RF Sensor Unit	Techy	TR1029-2	/	2023-11-24	2024-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2023-11-24	2024-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2023-11-24	2024-11-23
WIDEBAND RADIO COMMUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2023-11-24	2024-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2023-11-24	2024-11-23

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	/	2023-11-24	2024-11-23
RF Sensor Unit	Techy	TR1029-2	/	2023-11-24	2024-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2023-11-24	2024-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2023-11-24	2024-11-23
WIDEBAND RADIO COMMUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2023-11-24	2024-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2023-11-24	2024-11-23

Power Spectral Density					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
RFTest software	/	V1.00	/	/	/

RF Control Unit	Techy	TR1029-1	/	2023-11-24	2024-11-23
RF Sensor Unit	Techy	TR1029-2	/	2023-11-24	2024-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2023-11-24	2024-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2023-11-24	2024-11-23
WIDEBAND RADIO COMMUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2023-11-24	2024-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2023-11-24	2024-11-23

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	/	2023-11-24	2024-11-23
RF Sensor Unit	Techy	TR1029-2	/	2023-11-24	2024-11-23
Programmable constant temperature and humidity box	ZZCKONG	ZZ-K02A	20210928007	2023-11-24	2024-11-23
Adjustable Direct Current Regulated Power Supply	Dongguan Tongmen Electronic Technology Co., LTD	etm-6050c	20211026123	2023-11-24	2024-11-23
WIDEBAND RADIO COMMUNICATION TESTER	Rohde & Schwarz	CMW500	161997	2023-11-24	2024-11-23
MXA Signal Analyzer	KEYSIGHT	N9020A	MY50410020	2023-11-24	2024-11-23

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	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF1-SMAM-10m	21101566	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF1-SMAM-1m	21101568	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2023-11-24	2024-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2023-11-24	2024-11-23
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI7	101032	2023-11-24	2024-11-23
SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2023-11-24	2024-11-23

POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplifier	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	2023-11-28	2025-11-27

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	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF1-SMASMAM-10m	21101566	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1m	21101568	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2023-11-24	2024-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2023-11-28	2025-11-27
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI7	101032	2023-11-24	2024-11-23
SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2023-11-24	2024-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplifier	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	2023-11-28	2025-11-27

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	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF1-SMASMAM-10m	21101566	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF2-NMNM-10m	21101570	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF1-SMASMAM-1m	21101568	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF2-NMNM-1m	21101576	2023-11-24	2024-11-23
RE Cable	REBES Talent	UF2-NMNM-2.5m	21101573	2023-11-24	2024-11-23

POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Horn Antenna	SCHWARZBECK	BBHA9170	01157	2023-11-28	2025-11-27
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI7	101032	2023-11-24	2024-11-23
SIGNAL ANALYZER	ROHDE&SCHWARZ	FSQ40	100010	2023-11-24	2024-11-23
POSITIONAL CONTROLLER	SKET	PCI-GPIB	/	/	/
Broadband Preamplifier	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	2023-11-28	2025-11-27

4.2 Test Auxiliary Equipment

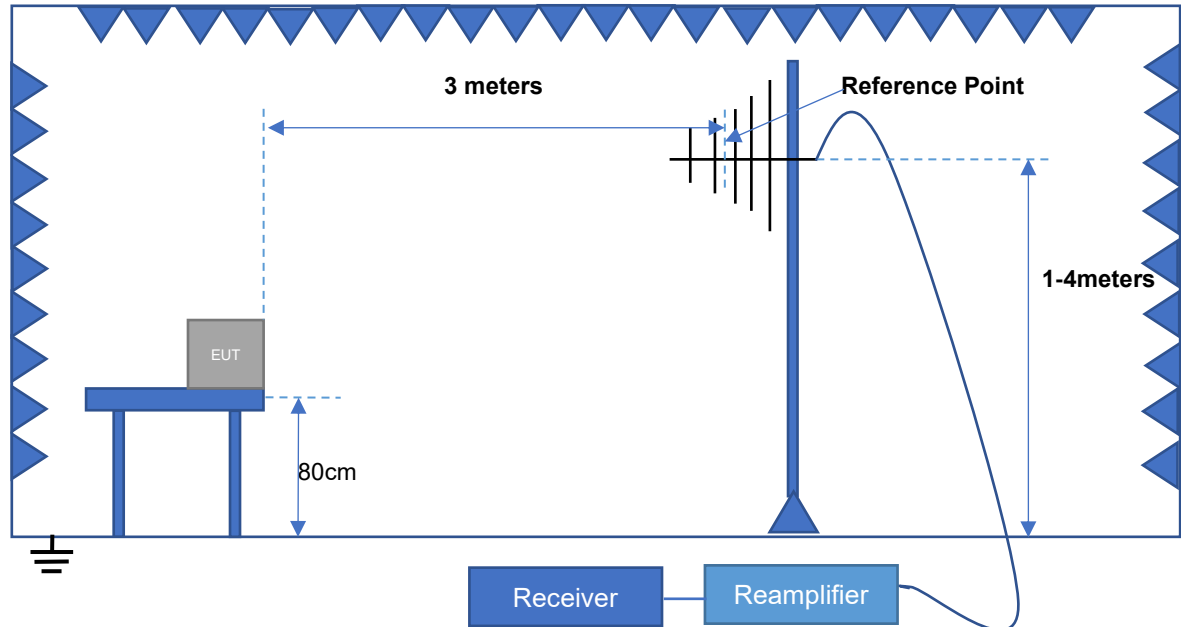
Item	Equipment	Manufacturer	Model/Type No.	Series No.	Note
1	Adapter	Clarion Hungary	CH01	/	
2	GPS antenna	Clarion Hungary	CH02	/	
3	Camera	Clarion Hungary	CH03	/	
4	Display	Clarion Hungary	CH04	/	
5	Controller	Clarion Hungary	CH05	/	

4.3 Test Modes

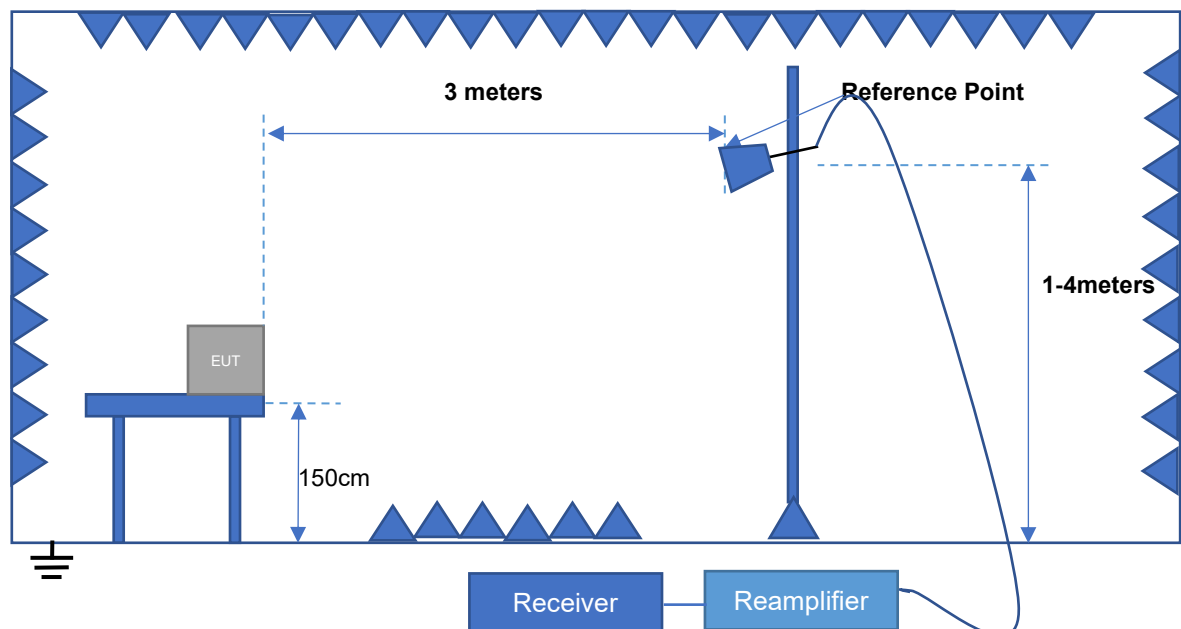
No.	Test Modes	Description
TM1	TX mode	Keep the EUT in continuously transmitting mode with GFSK modulation.

4.4 Test Setup

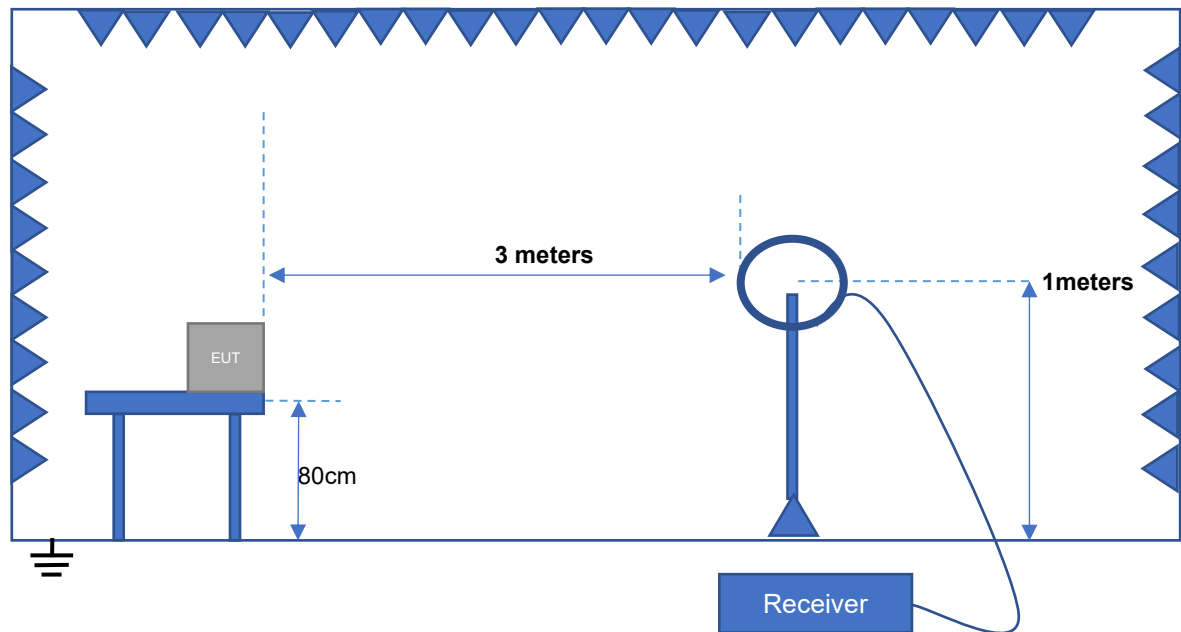
Test Setup 1



Radiation Test (30MHz – 1GHz)



Radiation Test (Above 1GHz)

Test Setup 2

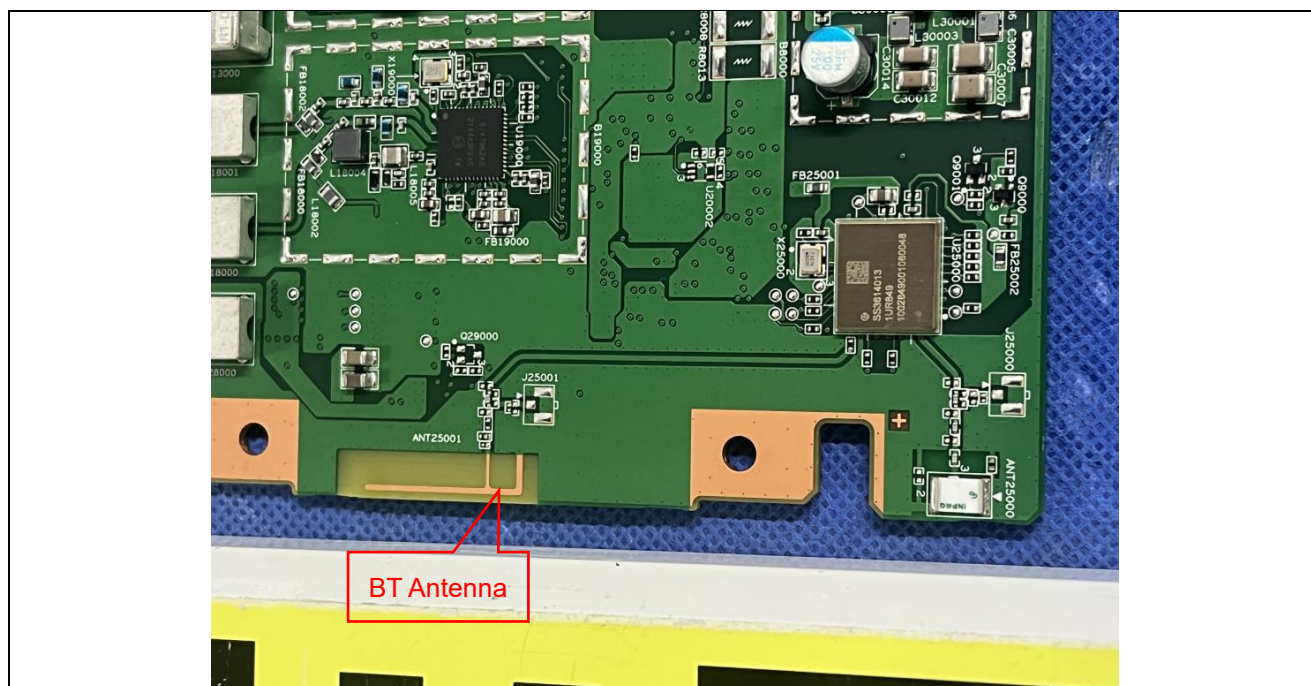
Radiation Test (9k - 30MHz)

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.
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5.1.1 Conclusion:



6 Radio Spectrum Matter Test Results (RF)

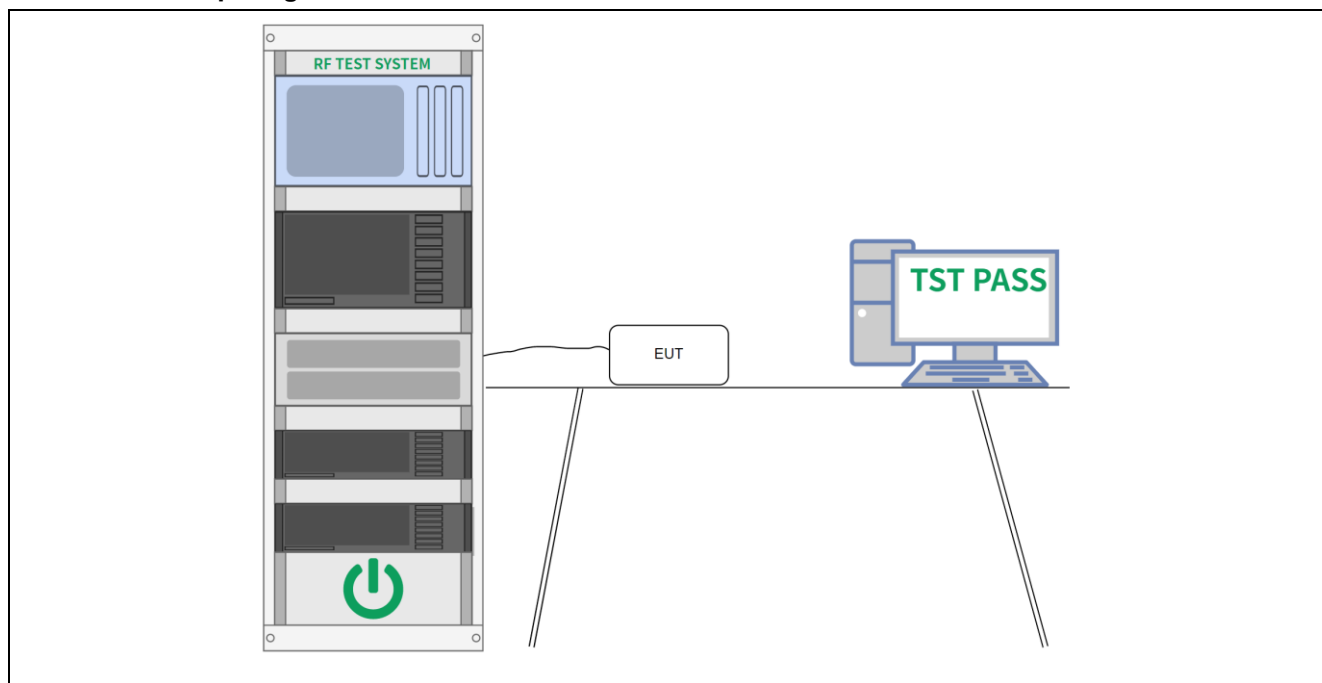
6.1 Occupied Bandwidth

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 $\geq [3 \times \text{RBW}]$. 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.

6.1.1 E.U.T. Operation:

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

6.1.2 Test Setup Diagram:



6.1.3 Test Data:

Please Refer to Appendix for Details.

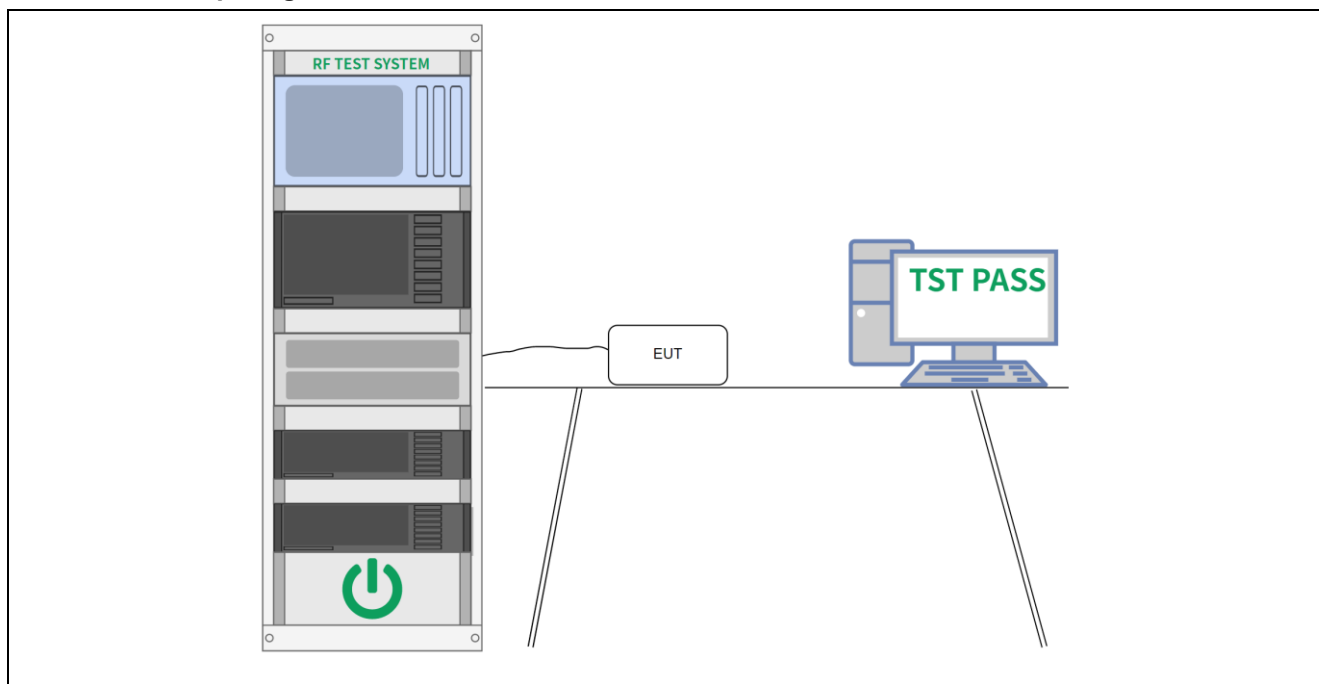
6.2 Maximum Conducted Output Power

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

6.2.1 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:

Please Refer to Appendix for Details.

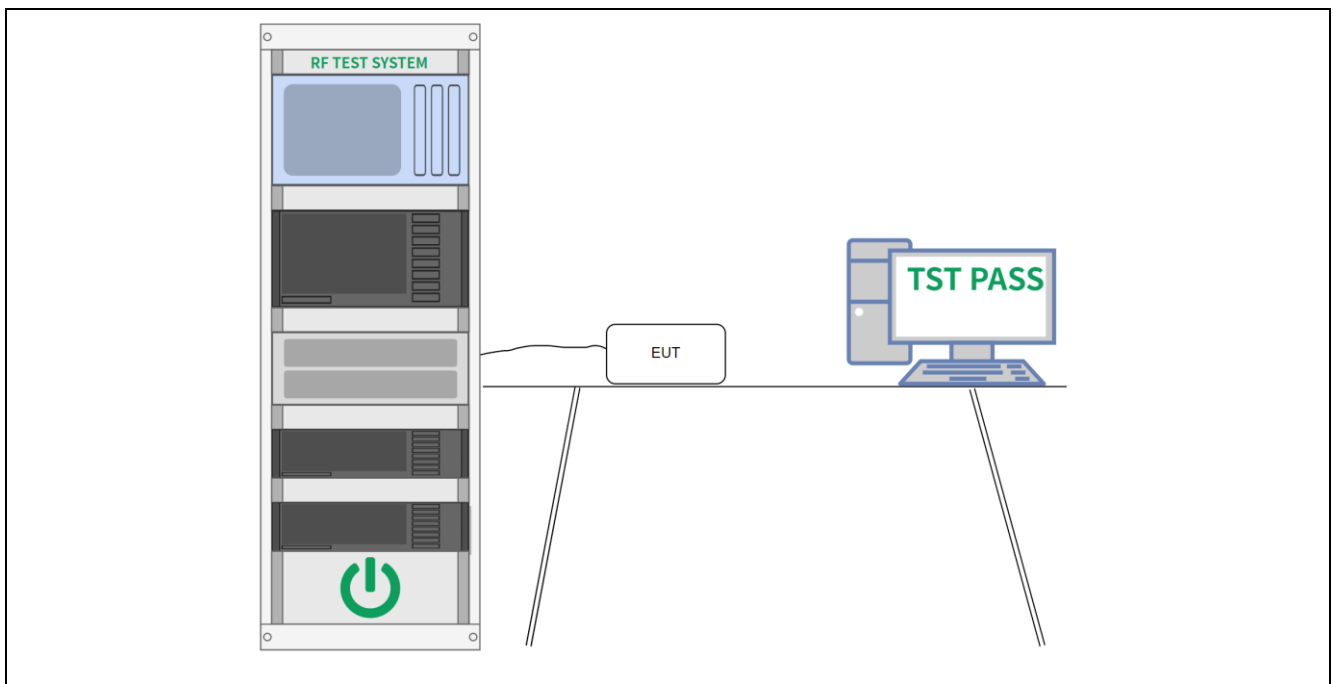
6.3 Power Spectral Density

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.

6.3.1 E.U.T. Operation:

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

6.3.2 Test Setup Diagram:



6.3.3 Test Data:

Please Refer to Appendix for Details.

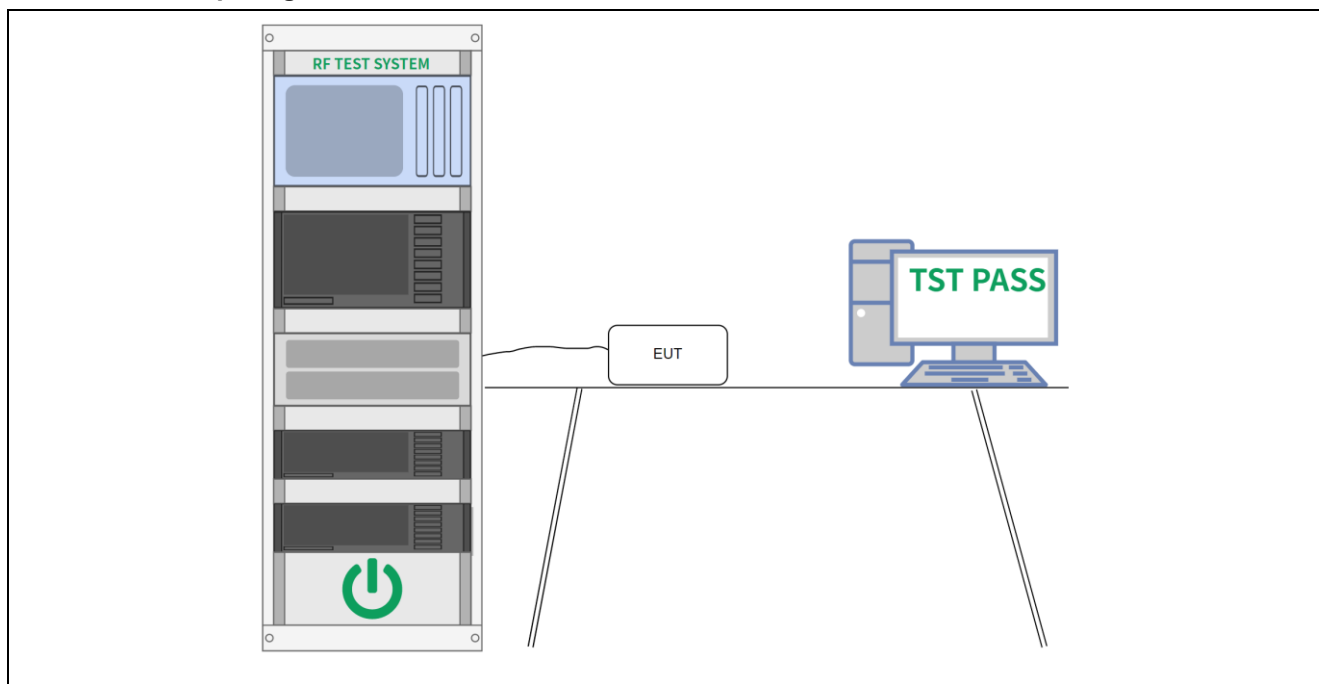
6.4 Emissions in non-restricted frequency bands

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

6.4.1 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:

Please Refer to Appendix for Details.

6.5 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		
Test Setup	See section 4.4 for test setup 1. The photo of test setup please refer to ANNEX		

6.5.1 E.U.T. Operation:

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

6.5.2 Test Data:

TM1 / Band: 2.4G / BW: 1

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2402									
V	2390.00	76.45	52.12	2.73	27.38	54.44	74.00	-19.56	PK
V	2390.00	65.20	52.12	2.73	27.38	43.19	54.00	-10.81	AV
V	2400.00	76.66	52.16	2.78	27.41	54.69	74.00	-19.31	PK
V	2400.00	64.79	52.16	2.78	27.41	42.82	54.00	-11.18	AV
H	2390.00	76.74	52.12	2.73	27.38	54.73	74.00	-19.27	PK
H	2390.00	65.23	52.12	2.73	27.38	43.22	54.00	-10.78	AV
H	2400.00	76.61	52.16	2.78	27.41	54.64	74.00	-19.36	PK
H	2400.00	65.17	52.16	2.78	27.41	43.20	54.00	-10.80	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2480									
V	2483.50	76.66	52.23	2.86	27.44	54.73	74.00	-19.27	PK
V	2483.50	65.44	52.23	2.86	27.44	43.51	54.00	-10.49	AV
V	2500.00	76.60	52.26	2.88	27.49	54.71	74.00	-19.29	PK
V	2500.00	64.90	52.26	2.88	27.49	43.01	54.00	-10.99	AV
H	2483.50	76.78	52.23	2.86	27.44	54.85	74.00	-19.15	PK
H	2483.50	65.48	52.23	2.86	27.44	43.55	54.00	-10.45	AV
H	2500.00	76.40	52.26	2.88	27.49	54.51	74.00	-19.49	PK
H	2500.00	65.74	52.26	2.88	27.49	43.85	54.00	-10.15	AV

Remark:

1. Emission Level = Meter Reading + Factor, 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.

TM1 / Band: 2.4G / BW: 2

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2402									
V	2390.00	76.37	52.12	2.73	27.38	54.36	74.00	-19.64	PK
V	2390.00	65.13	52.12	2.73	27.38	43.12	54.00	-10.88	AV
V	2400.00	76.58	52.16	2.78	27.41	54.61	74.00	-19.39	PK
V	2400.00	64.72	52.16	2.78	27.41	42.75	54.00	-11.25	AV
H	2390.00	76.66	52.12	2.73	27.38	54.65	74.00	-19.35	PK
H	2390.00	65.16	52.12	2.73	27.38	43.15	54.00	-10.85	AV
H	2400.00	76.53	52.16	2.78	27.41	54.56	74.00	-19.44	PK
H	2400.00	65.10	52.16	2.78	27.41	43.13	54.00	-10.87	AV

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre-amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2480									
V	2483.50	76.58	52.23	2.86	27.44	54.65	74.00	-19.35	PK
V	2483.50	65.37	52.23	2.86	27.44	43.44	54.00	-10.56	AV
V	2500.00	76.52	52.26	2.88	27.49	54.63	74.00	-19.37	PK
V	2500.00	64.83	52.26	2.88	27.49	42.94	54.00	-11.06	AV
H	2483.50	76.70	52.23	2.86	27.44	54.77	74.00	-19.23	PK
H	2483.50	65.41	52.23	2.86	27.44	43.48	54.00	-10.52	AV
H	2500.00	76.32	52.26	2.88	27.49	54.43	74.00	-19.57	PK
H	2500.00	65.67	52.26	2.88	27.49	43.78	54.00	-10.22	AV

Remark:

1. Emission Level = Meter Reading + Factor, 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.

6.6 Radiated Emissions of 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		
Test Setup	See section 4.4 for test setup 1&2. The photo of test setup please refer to ANNEX		

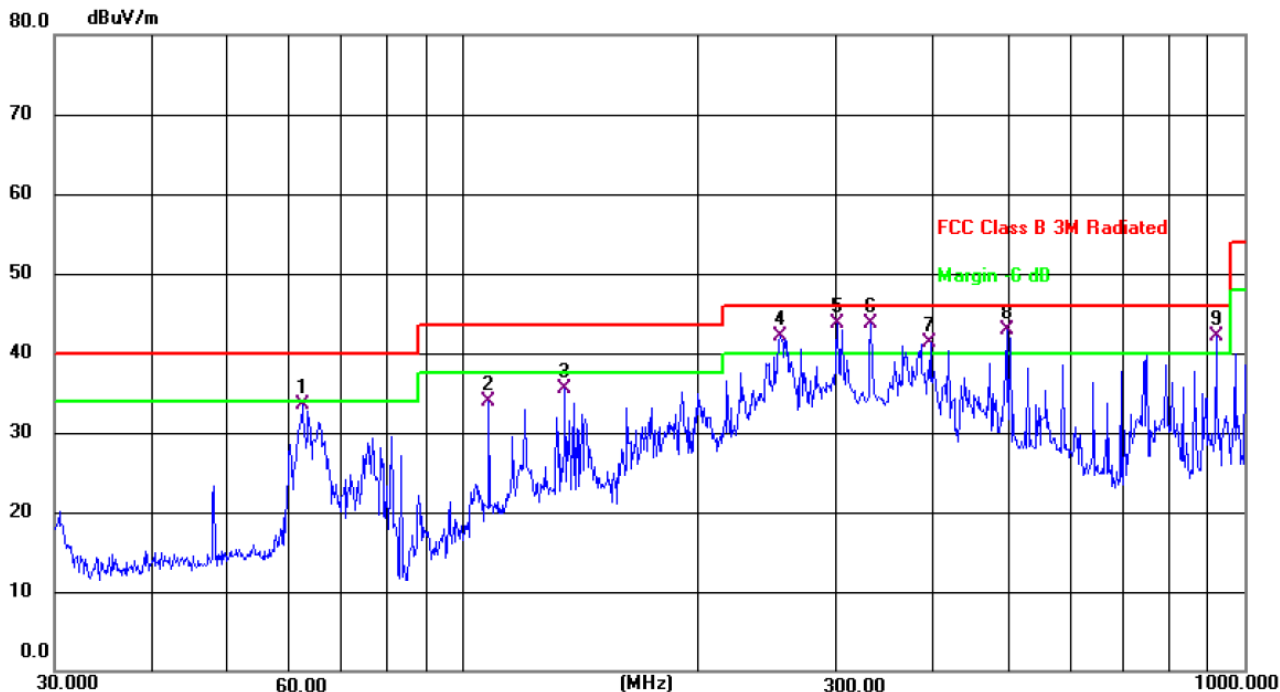
6.6.1 E.U.T. Operation:

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

6.6.2 Test Data:

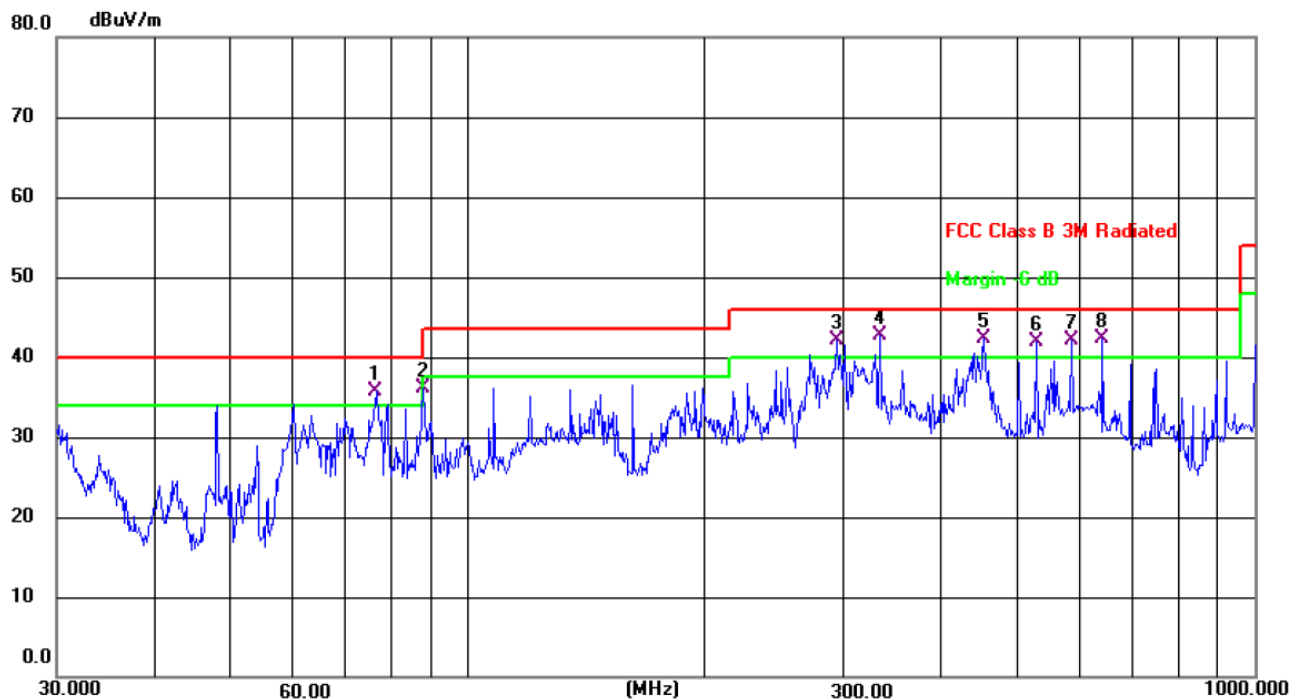
Note: All the mode have been tested, and only the worst case of 1M mode are in the report

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



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Margin dB	Detector
1		62.2128	46.73	-13.29	33.44	40.00	-6.56	QP
2		107.8876	50.53	-16.53	34.00	43.50	-9.50	QP
3		135.0318	52.67	-17.17	35.50	43.50	-8.00	QP
4	!	254.7281	54.79	-12.61	42.18	46.00	-3.82	QP
5	*	301.4223	55.15	-11.40	43.75	46.00	-2.25	QP
6	!	332.5187	54.51	-10.89	43.62	46.00	-2.38	QP
7	!	396.2412	51.21	-9.84	41.37	46.00	-4.63	QP
8	!	495.9343	50.55	-7.64	42.91	46.00	-3.09	QP
9	!	919.2865	42.26	-0.23	42.03	46.00	-3.97	QP

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



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	!	76.5119	52.58	-16.79	35.79	40.00	-4.21	QP
2	!	87.7245	53.17	-17.13	36.04	40.00	-3.96	QP
3	!	294.1136	53.68	-11.57	42.11	46.00	-3.89	QP
4	*	333.6865	53.50	-10.87	42.63	46.00	-3.37	QP
5	!	452.7196	50.95	-8.60	42.35	46.00	-3.65	QP
6	!	528.2458	49.10	-7.13	41.97	46.00	-4.03	QP
7	!	584.7894	48.50	-6.33	42.17	46.00	-3.83	QP
8	!	640.6109	47.47	-5.20	42.27	46.00	-3.73	QP

6.7 Radiated Emissions of 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		
Test Setup	See section 4.4 for test setup 1. The photo of test setup please refer to ANNEX		

6.7.1 E.U.T. Operation:

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

6.7.2 Test Data:

TM1 / Band: 2.4G / BW: 1

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre- amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2402									
V	4804.00	67.77	50.64	6.78	31.25	55.16	74.00	-18.84	PK
V	4804.00	55.35	50.64	6.78	31.25	42.74	54.00	-11.26	AV
V	7206.00	66.56	49.95	7.11	36.53	60.25	74.00	-13.75	PK
V	7206.00	54.81	49.95	7.11	36.53	48.50	54.00	-5.50	AV
V	16129.00	48.98	51.56	11.36	41.57	50.35	74.00	-23.65	PK
H	4804.00	66.84	50.64	6.78	31.25	54.23	74.00	-19.77	PK
H	4804.00	55.45	50.64	6.78	31.25	42.84	54.00	-11.16	AV
H	7206.00	69.77	49.95	7.11	36.53	63.46	74.00	-10.54	PK
H	7206.00	53.68	49.95	7.11	36.53	47.37	54.00	-6.63	AV
H	16129.00	48.94	51.56	11.36	41.57	50.31	74.00	-23.69	PK
operation frequency:2440									
V	4880.00	67.54	50.69	6.83	31.37	55.05	74.00	-18.95	PK
V	4880.00	55.16	50.69	6.83	31.37	42.67	54.00	-11.33	AV
V	7320.00	69.42	49.99	7.22	36.53	63.18	74.00	-10.82	PK
V	7320.00	53.47	49.99	7.22	31.25	41.95	54.00	-12.05	AV
V	16129.00	48.81	51.56	11.36	41.57	50.18	74.00	-23.82	PK
H	4880.00	66.62	50.69	6.83	31.37	54.13	74.00	-19.87	PK
H	4880.00	55.26	50.69	6.83	31.37	42.77	54.00	-11.23	AV
H	7320.00	69.51	49.99	7.22	36.53	63.27	74.00	-10.73	PK
H	7320.00	53.58	49.99	7.22	31.25	42.06	54.00	-11.94	AV
H	16129.00	48.77	51.56	11.36	41.57	50.14	74.00	-23.86	PK
operation frequency:2480									
V	4960.00	68.02	50.86	6.86	31.41	55.43	74.00	-18.57	PK
V	4960.00	55.56	50.86	6.86	31.41	42.97	54.00	-11.03	AV
V	7440.00	69.20	50.14	7.27	36.58	62.91	74.00	-11.09	PK
V	7440.00	53.35	50.14	7.27	31.28	41.76	54.00	-12.24	AV
V	16129.00	49.17	51.56	11.36	41.57	50.54	74.00	-23.46	PK
H	4960.00	67.09	50.86	6.86	31.41	54.50	74.00	-19.50	PK
H	4960.00	55.66	50.86	6.86	31.41	43.07	54.00	-10.93	AV
H	7440.00	67.44	50.14	7.27	36.58	61.15	74.00	-12.85	PK
H	7440.00	55.38	50.14	7.27	31.28	43.79	54.00	-10.21	AV
H	16129.00	49.13	51.56	11.36	41.57	50.50	74.00	-23.50	PK
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.									

TM1 / Band: 2.4G / BW: 2

Polar (H/V)	Frequency (MHz)	Meter Reading (dBuV)	Pre- amplifier (dB)	Cable Loss (dB)	Antenna Factor (dB/m)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Detector Type
operation frequency:2402									
V	4804.00	67.70	50.64	6.78	31.25	55.09	74.00	-18.91	PK
V	4804.00	55.29	50.64	6.78	31.25	42.68	54.00	-11.32	AV
V	7206.00	66.49	49.95	7.11	36.53	60.18	74.00	-13.82	PK
V	7206.00	54.75	49.95	7.11	36.53	48.44	54.00	-5.56	AV
V	16129.00	48.93	51.56	11.36	41.57	50.30	74.00	-23.70	PK
H	4804.00	66.77	50.64	6.78	31.25	54.16	74.00	-19.84	PK
H	4804.00	55.39	50.64	6.78	31.25	42.78	54.00	-11.22	AV
H	7206.00	69.70	49.95	7.11	36.53	63.39	74.00	-10.61	PK
H	7206.00	53.62	49.95	7.11	36.53	47.31	54.00	-6.69	AV
H	16129.00	48.89	51.56	11.36	41.57	50.26	74.00	-23.74	PK
operation frequency:2440									
V	4880.00	67.47	50.69	6.83	31.37	54.98	74.00	-19.02	PK
V	4880.00	55.10	50.69	6.83	31.37	42.61	54.00	-11.39	AV
V	7320.00	69.35	49.99	7.22	36.53	63.11	74.00	-10.89	PK
V	7320.00	53.41	49.99	7.22	31.25	41.89	54.00	-12.11	AV
V	16129.00	48.76	51.56	11.36	41.57	50.13	74.00	-23.87	PK
H	4880.00	66.55	50.69	6.83	31.37	54.06	74.00	-19.94	PK
H	4880.00	55.20	50.69	6.83	31.37	42.71	54.00	-11.29	AV
H	7320.00	69.44	49.99	7.22	36.53	63.20	74.00	-10.80	PK
H	7320.00	53.52	49.99	7.22	31.25	42.00	54.00	-12.00	AV
H	16129.00	48.72	51.56	11.36	41.57	50.09	74.00	-23.91	PK
operation frequency:2480									
V	4960.00	67.95	50.86	6.86	31.41	55.36	74.00	-18.64	PK
V	4960.00	55.50	50.86	6.86	31.41	42.91	54.00	-11.09	AV
V	7440.00	69.13	50.14	7.27	36.58	62.84	74.00	-11.16	PK
V	7440.00	53.29	50.14	7.27	31.28	41.70	54.00	-12.30	AV
V	16129.00	49.12	51.56	11.36	41.57	50.49	74.00	-23.51	PK
H	4960.00	67.02	50.86	6.86	31.41	54.43	74.00	-19.57	PK
H	4960.00	55.60	50.86	6.86	31.41	43.01	54.00	-10.99	AV
H	7440.00	67.37	50.14	7.27	36.58	61.08	74.00	-12.92	PK
H	7440.00	55.32	50.14	7.27	31.28	43.73	54.00	-10.27	AV
H	16129.00	49.08	51.56	11.36	41.57	50.45	74.00	-23.55	PK
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.									

7 Test Setup Photos

Please refer to the setup photos

8 EUT Constructional Details (EUT Photos)

Please refer to the external photos and internal photos.

Appendix

1. Duty Cycle

1.1 Ant1

1.1.1 Test Result

Ant1							
Mode	TX Type	Frequency (MHz)	T_on (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)	Max. DC Variation (%)
1M	SISO	2402	2.144	2.499	100	0	0.03
		2440	2.145	2.501	100	0	0.03
		2480	2.144	2.499	100	0	0.03
2M	SISO	2402	1.091	1.875	100	0	0.03
		2440	1.090	1.875	100	0	0.03
		2480	1.090	1.875	100	0	0.03

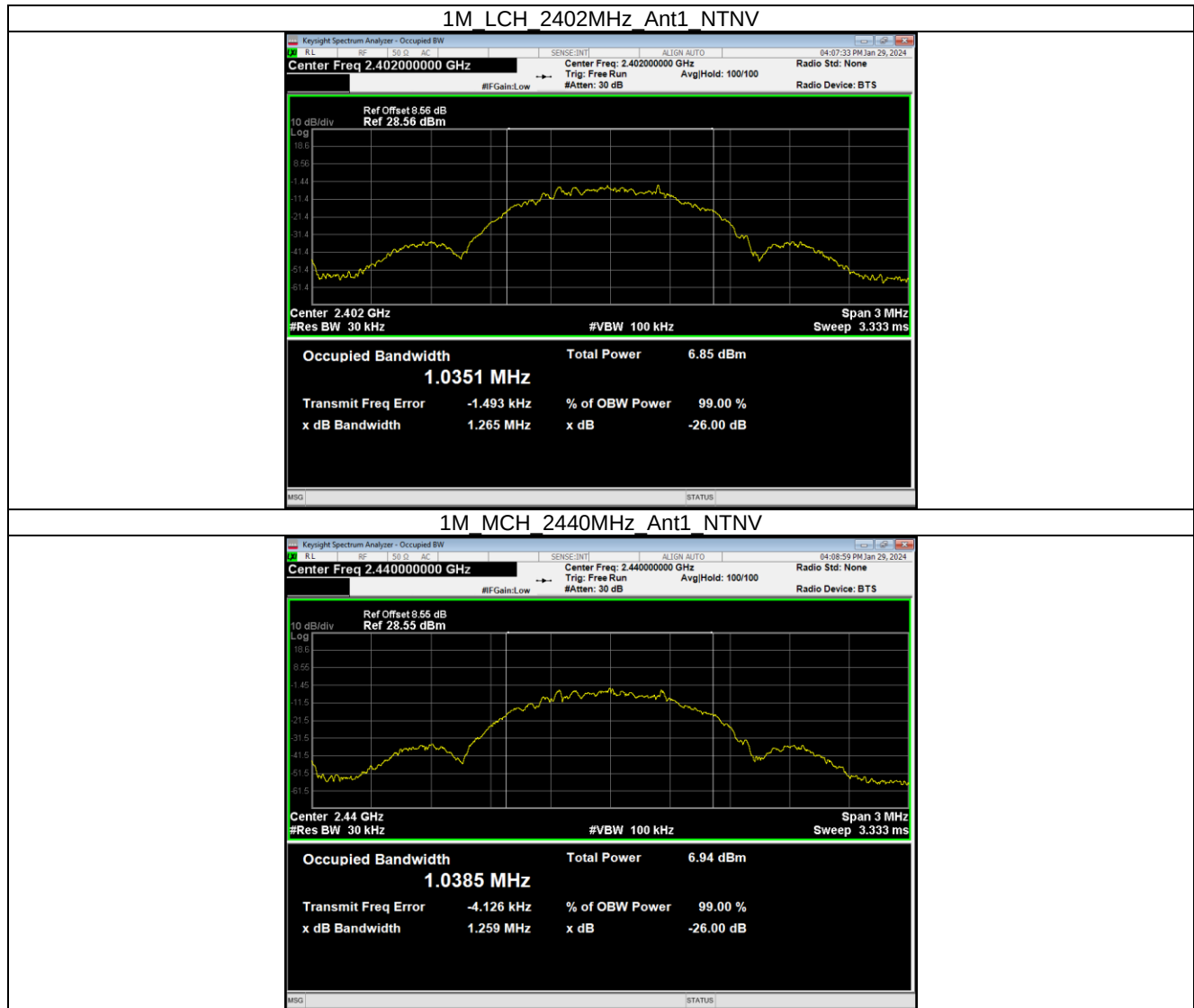
2. Bandwidth

2.1 OBW

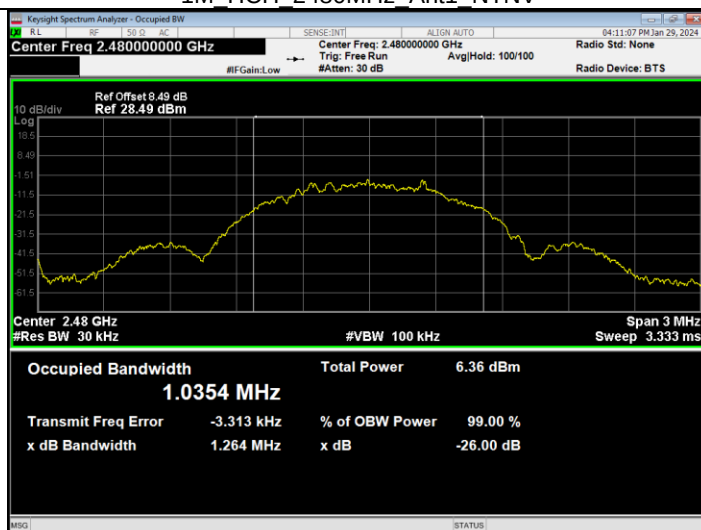
2.1.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	99% Occupied Bandwidth (MHz)	Verdict
				Result	
1M	SISO	2402	1	1.035105195	Pass
		2440	1	1.038470673	Pass
		2480	1	1.03541572	Pass
2M	SISO	2402	1	2.031272119	Pass
		2440	1	2.04594923	Pass
		2480	1	2.04458224	Pass

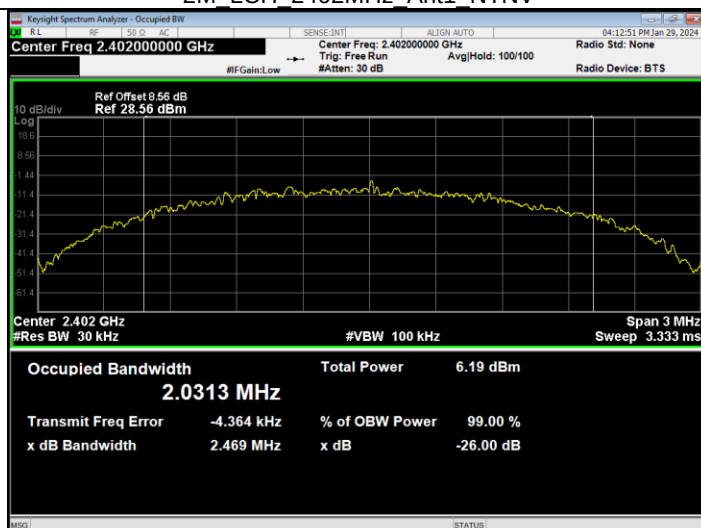
2.1.2 Test Graph



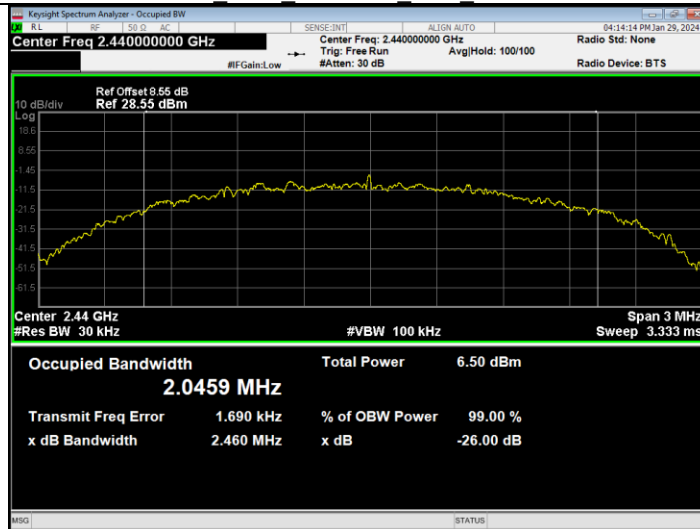
1M HCH 2480MHz Ant1 NTN



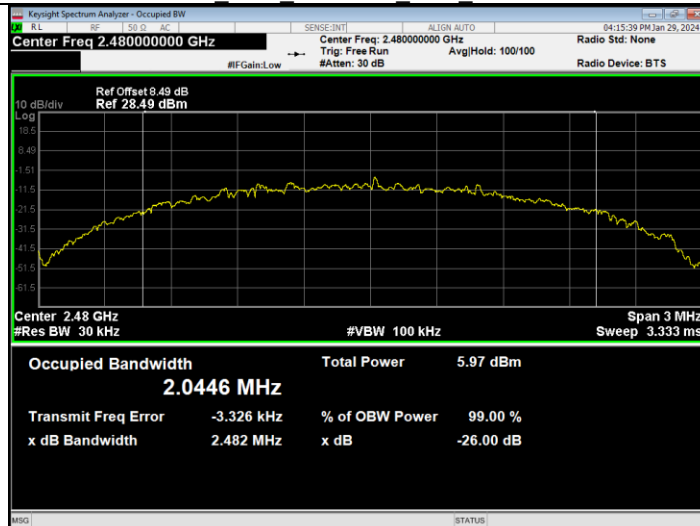
2M LCH 2402MHz Ant1 NTN



2M MCH 2440MHz Ant1 NTN



2M HCH 2480MHz Ant1 NTN



2.2 6dB BW

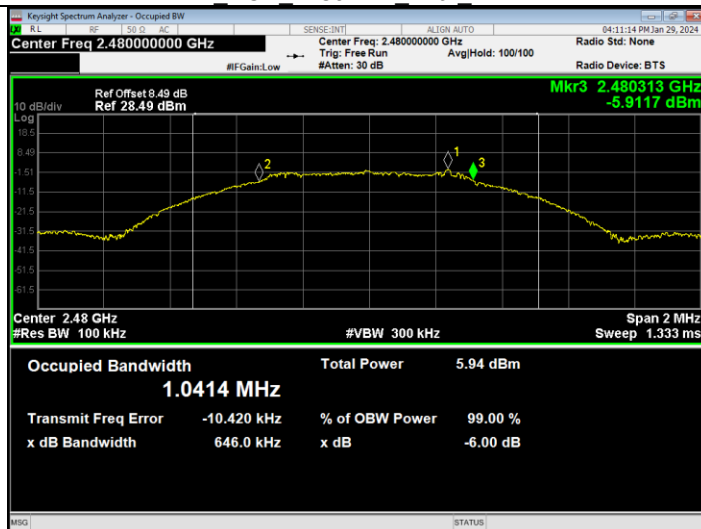
2.2.1 Test Result

Mode	TX Type	Frequency (MHz)	ANT	6dB Bandwidth (MHz)		Verdict
				Result	Limit	
1M	SISO	2402	1	0.663	≥ 0.5	Pass
		2440	1	0.659	≥ 0.5	Pass
		2480	1	0.646	≥ 0.5	Pass
2M	SISO	2402	1	1.156	≥ 0.5	Pass
		2440	1	1.146	≥ 0.5	Pass
		2480	1	1.197	≥ 0.5	Pass

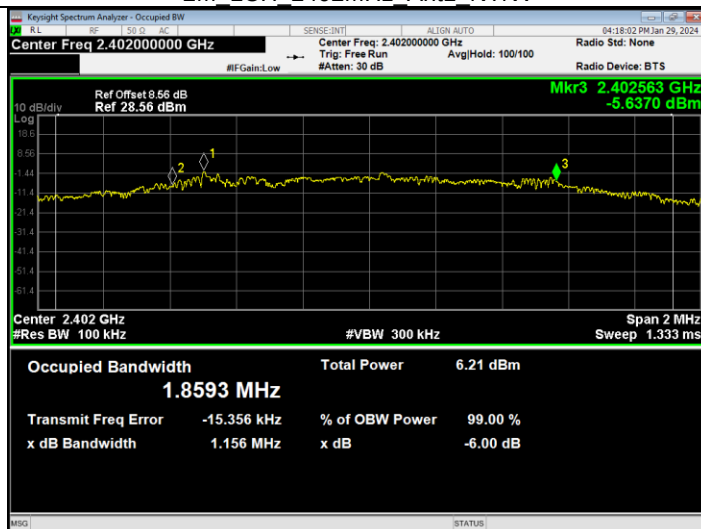
2.2.2 Test Graph



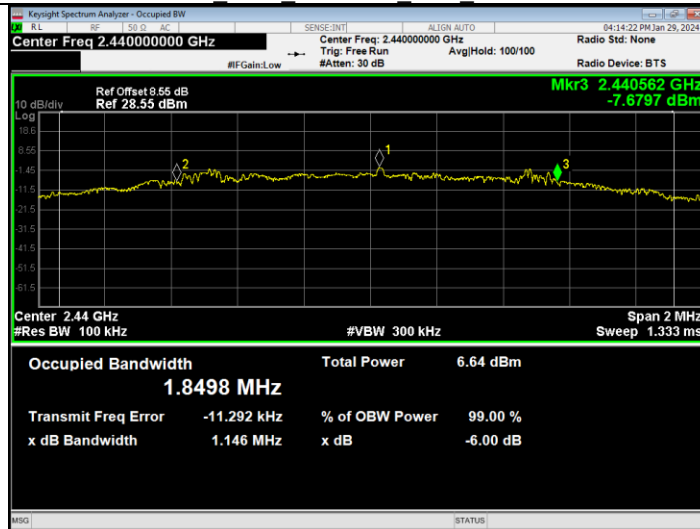
1M HCH 2480MHz Ant1 NTN



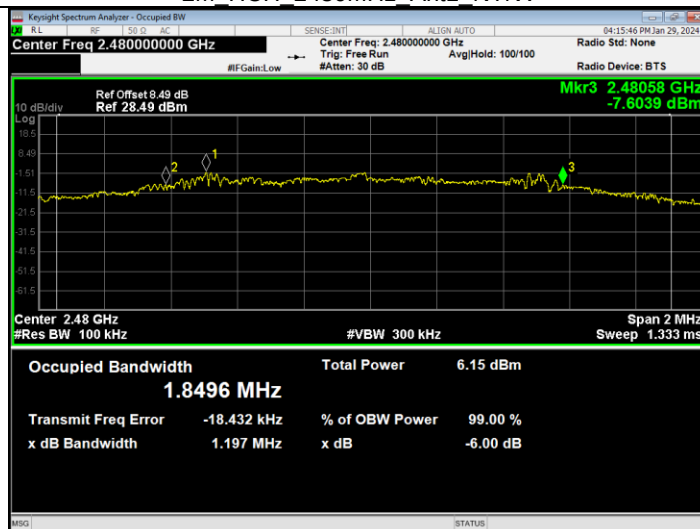
2M LCH 2402MHz Ant1 NTN



2M MCH 2440MHz Ant1 NTNv



2M HCH 2480MHz Ant1 NTNv



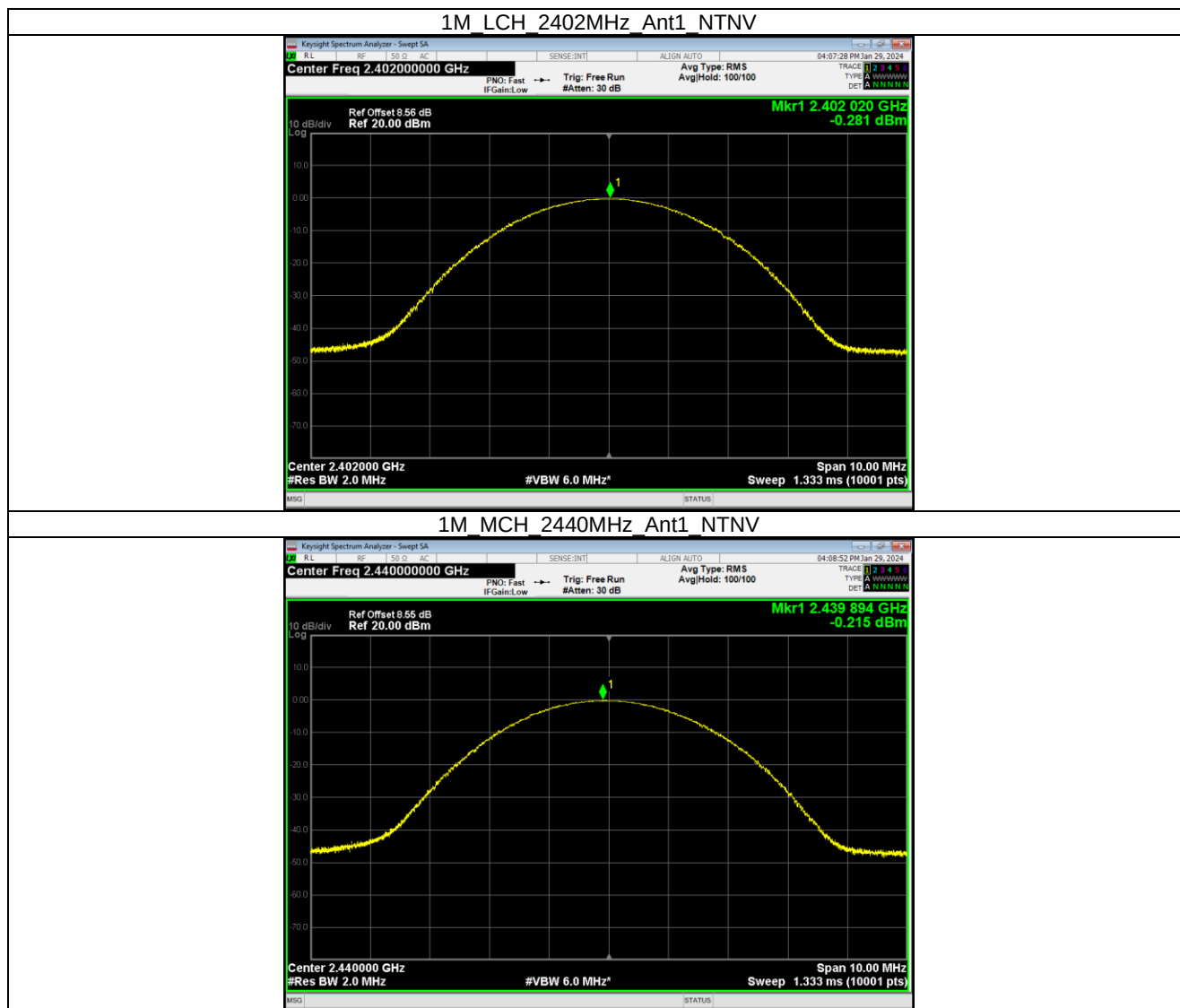
3. Maximum Conducted Output Power

3.1 Power

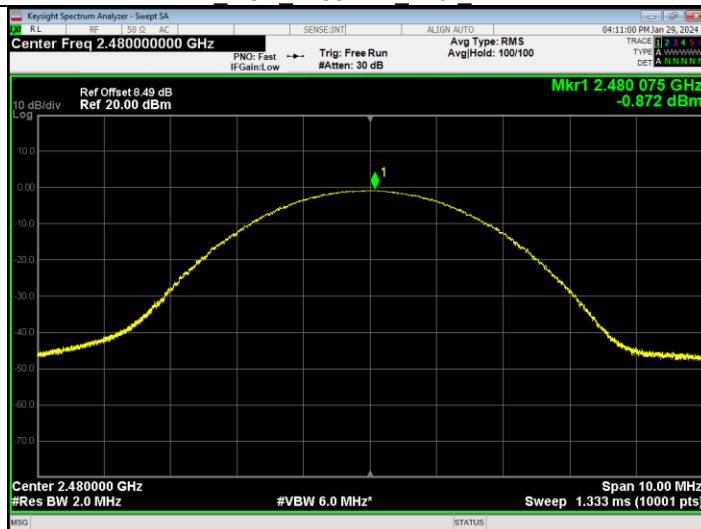
3.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Maximum Peak Conducted Output Power (dBm)		Verdict
			ANT1	Limit	
1M	SISO	2402	-0.281	<=30	Pass
		2440	-0.215	<=30	Pass
		2480	-0.872	<=30	Pass
2M	SISO	2402	-4.015	<=30	Pass
		2440	-3.159	<=30	Pass
		2480	-3.904	<=30	Pass
Note1: Antenna Gain: Ant1: 1dBi;					

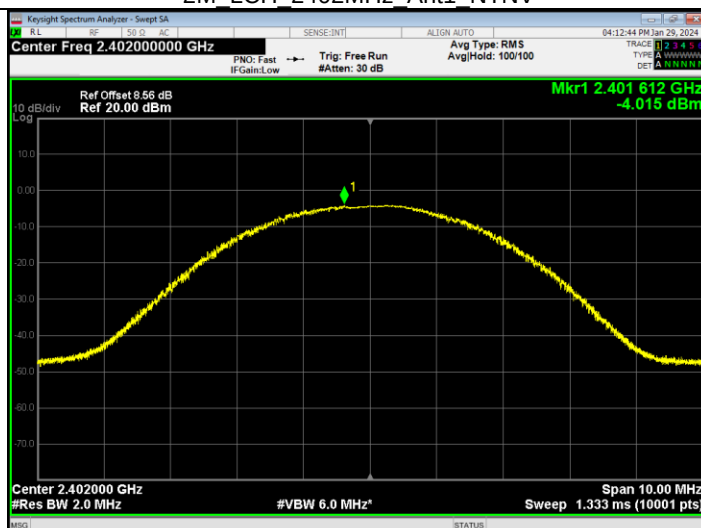
3.1.2 Test Graph



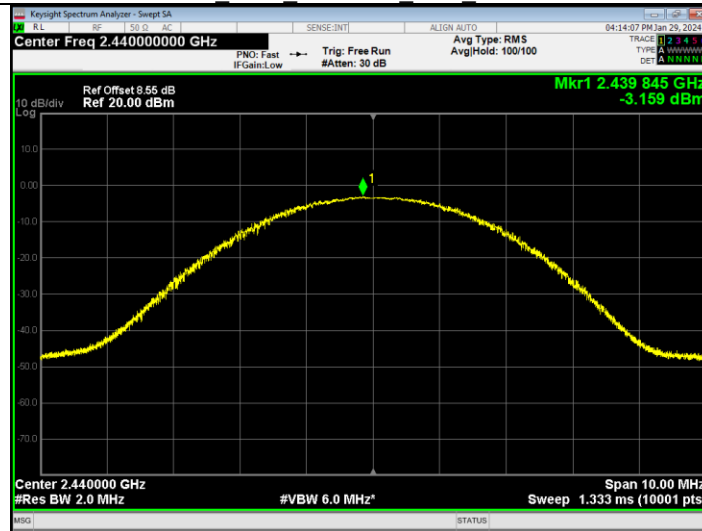
1M HCH 2480MHz Ant1 NTN



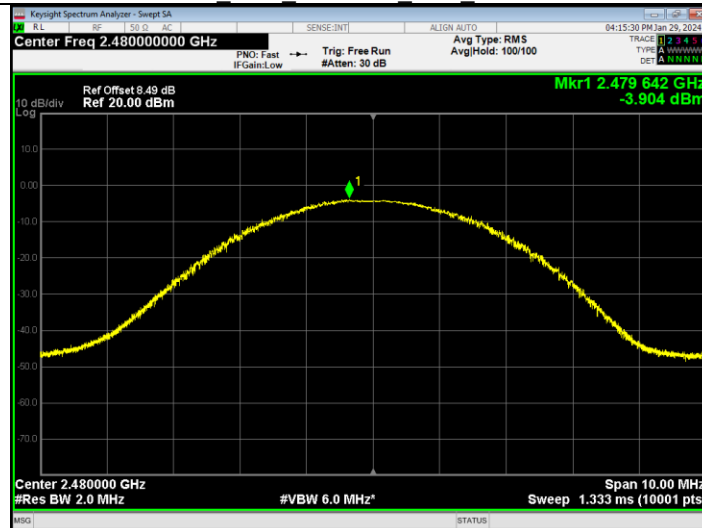
2M LCH 2402MHz Ant1 NTN



2M MCH 2440MHz Ant1 NTNv



2M HCH 2480MHz Ant1 NTNv



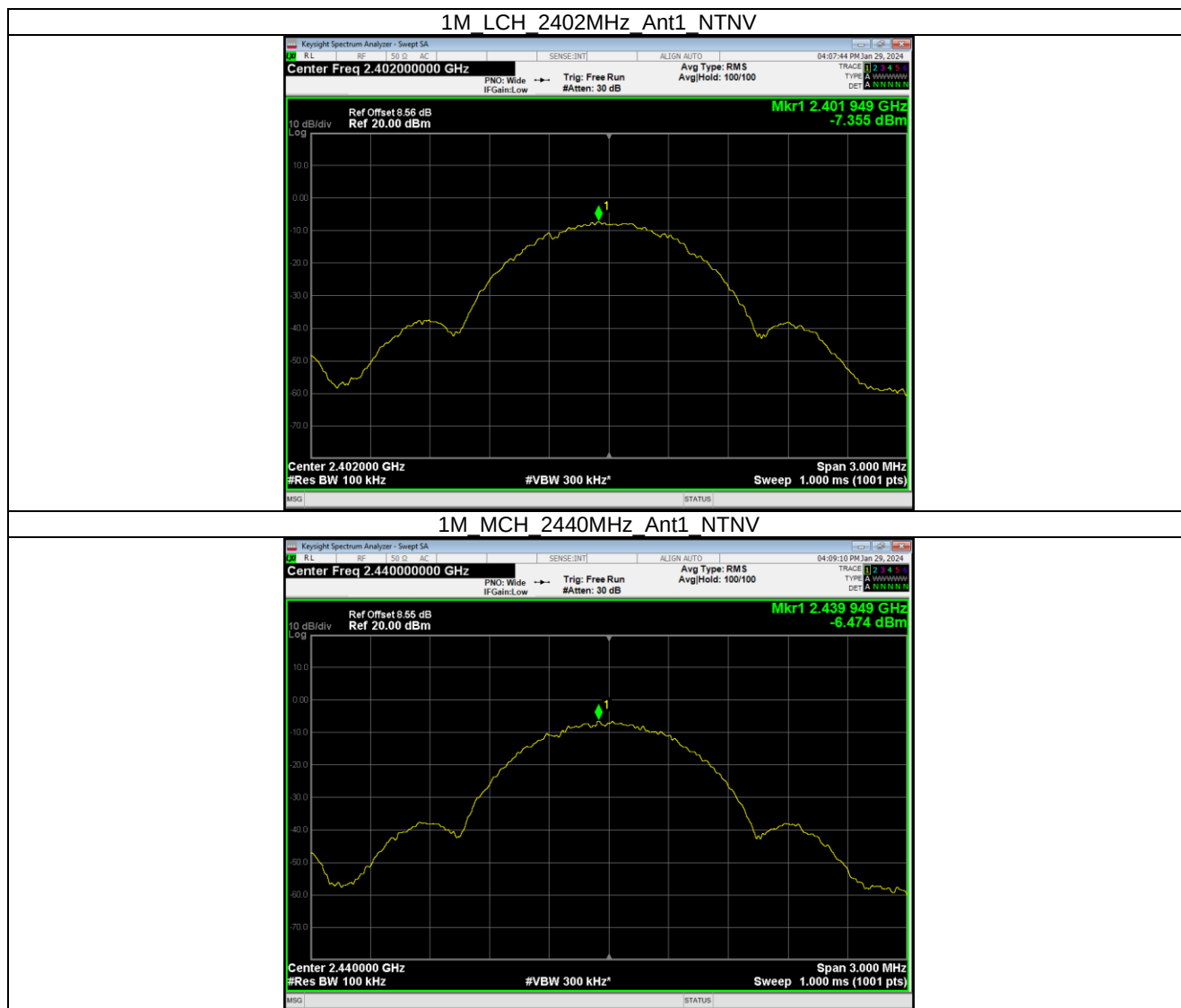
4. Maximum Power Spectral Density

4.1 PSD

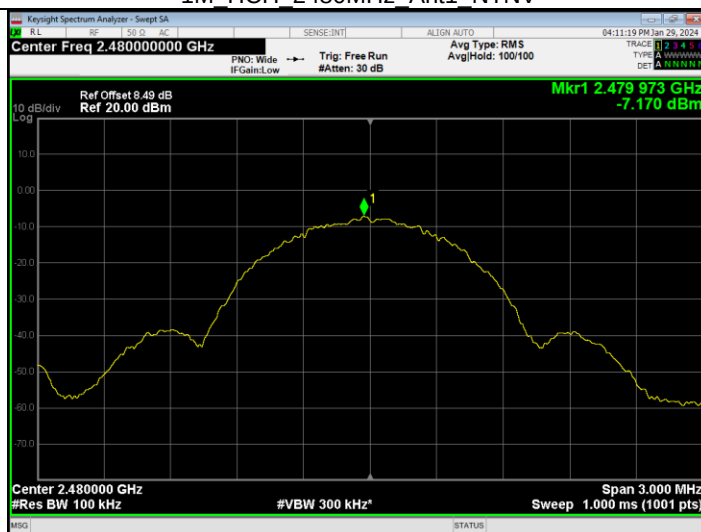
4.1.1 Test Result

Mode	TX Type	Frequency (MHz)	Maximum PSD				Verdict
			Reading level in 100kHz(dBm)	Factor (dB)	Result (dBm/3kHz)	Limit	
1M	SISO	2402	-7.355	15.23	-22.59	<=8	Pass
		2440	-6.474	15.23	-21.70	<=8	Pass
		2480	-7.17	15.23	-22.40	<=8	Pass
2M	SISO	2402	-12.758	15.23	-27.99	<=8	Pass
		2440	-11.818	15.23	-27.05	<=8	Pass
		2480	-12.968	15.23	-28.20	<=8	Pass
Note1: Antenna Gain: Ant1: 1 dBi; Result= Reading level in 100kHz-Factor(10log(100/3))							

4.1.2 Test Graph



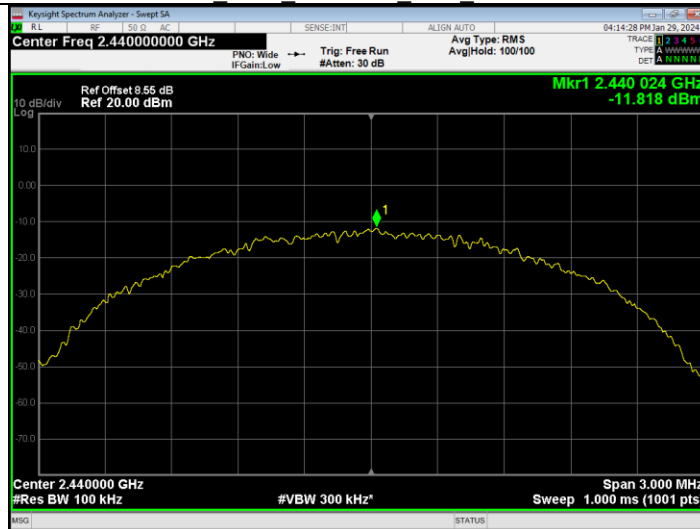
1M HCH 2480MHz Ant1 NTN



2M LCH 2402MHz Ant1 NTN



2M MCH 2440MHz Ant1 NTN



2M HCH 2480MHz Ant1 NTN



5. Unwanted Emissions In Non-restricted Frequency Bands

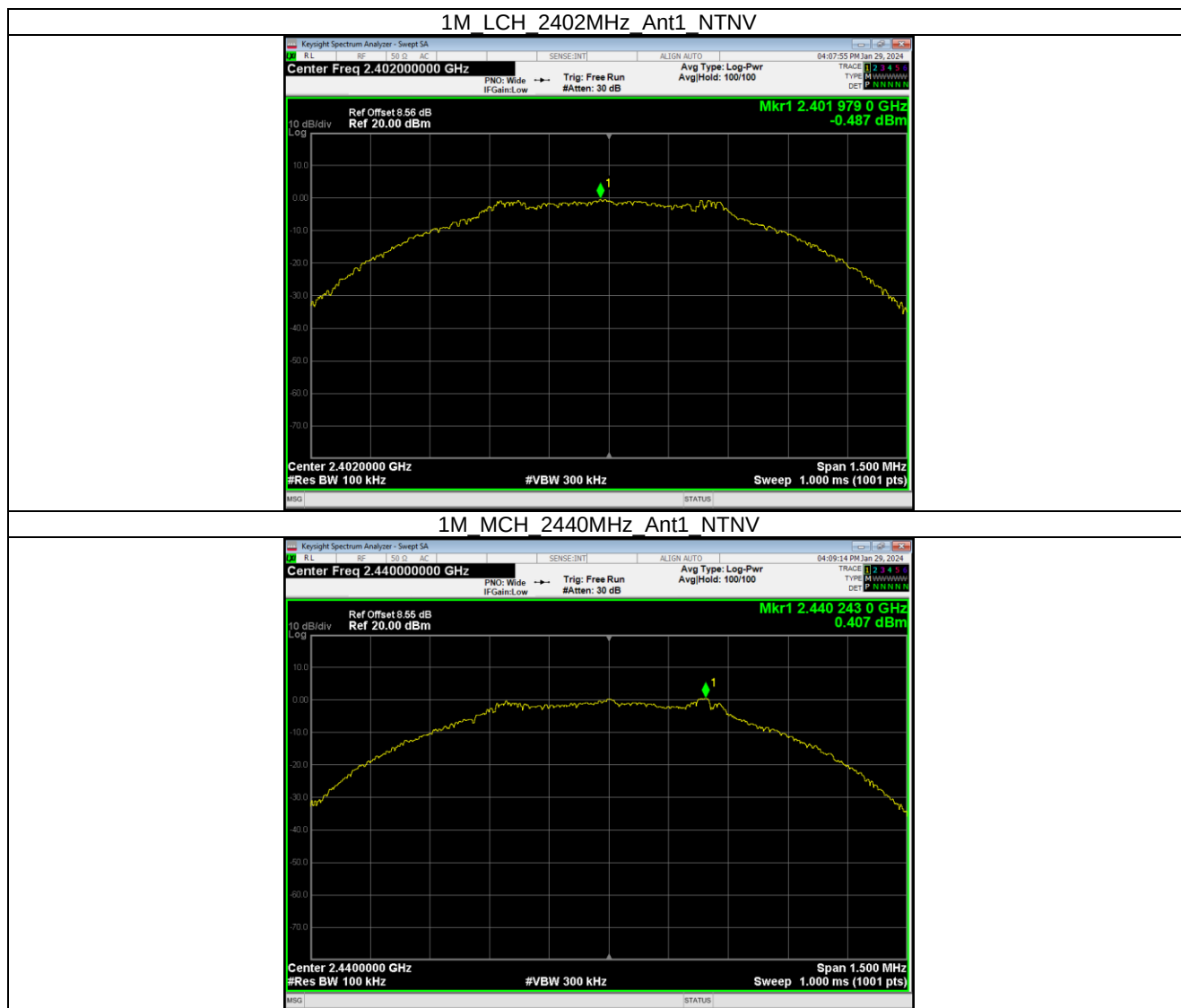
5.1 Ref

5.1.1 Test Result

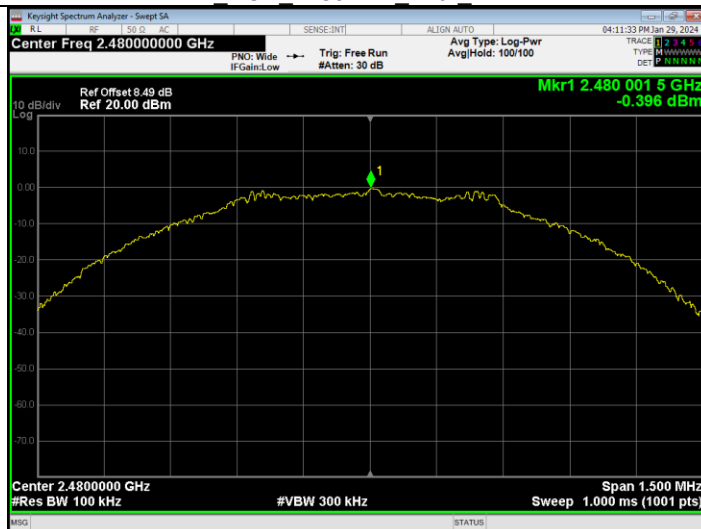
Mode	TX Type	Frequency (MHz)	ANT	Level of Reference (dBm)
1M	SISO	2402	1	-0.487
		2440	1	0.407
		2480	1	-0.396
2M	SISO	2402	1	-0.007
		2440	1	-0.559
		2480	1	-0.311

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

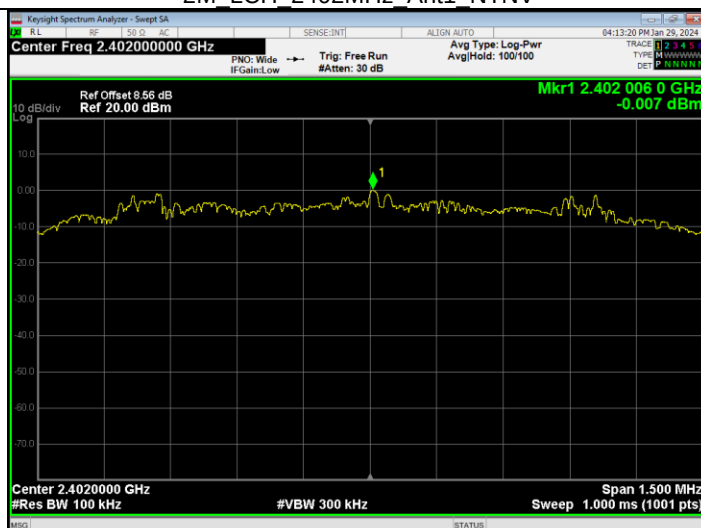
5.1.2 Test Graph



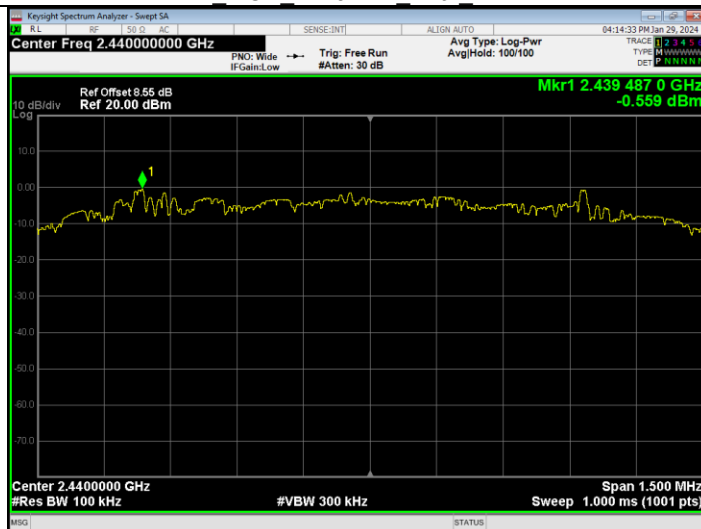
1M HCH 2480MHz Ant1 NTN



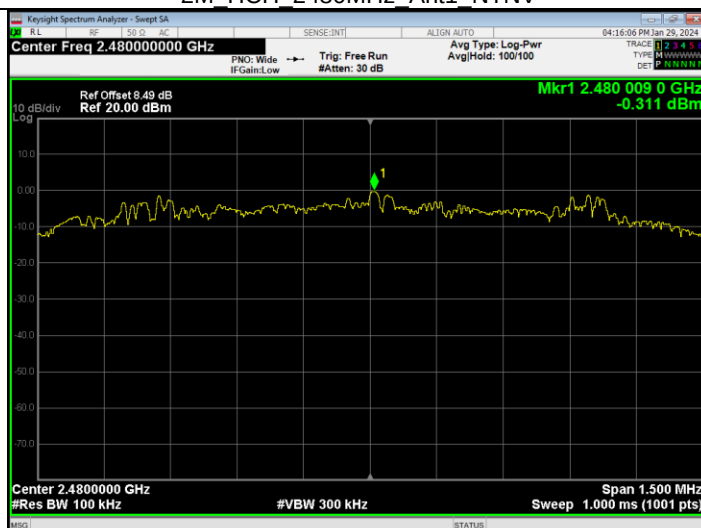
2M LCH 2402MHz Ant1 NTN



2M MCH 2440MHz Ant1 NTN



2M HCH 2480MHz Ant1 NTN

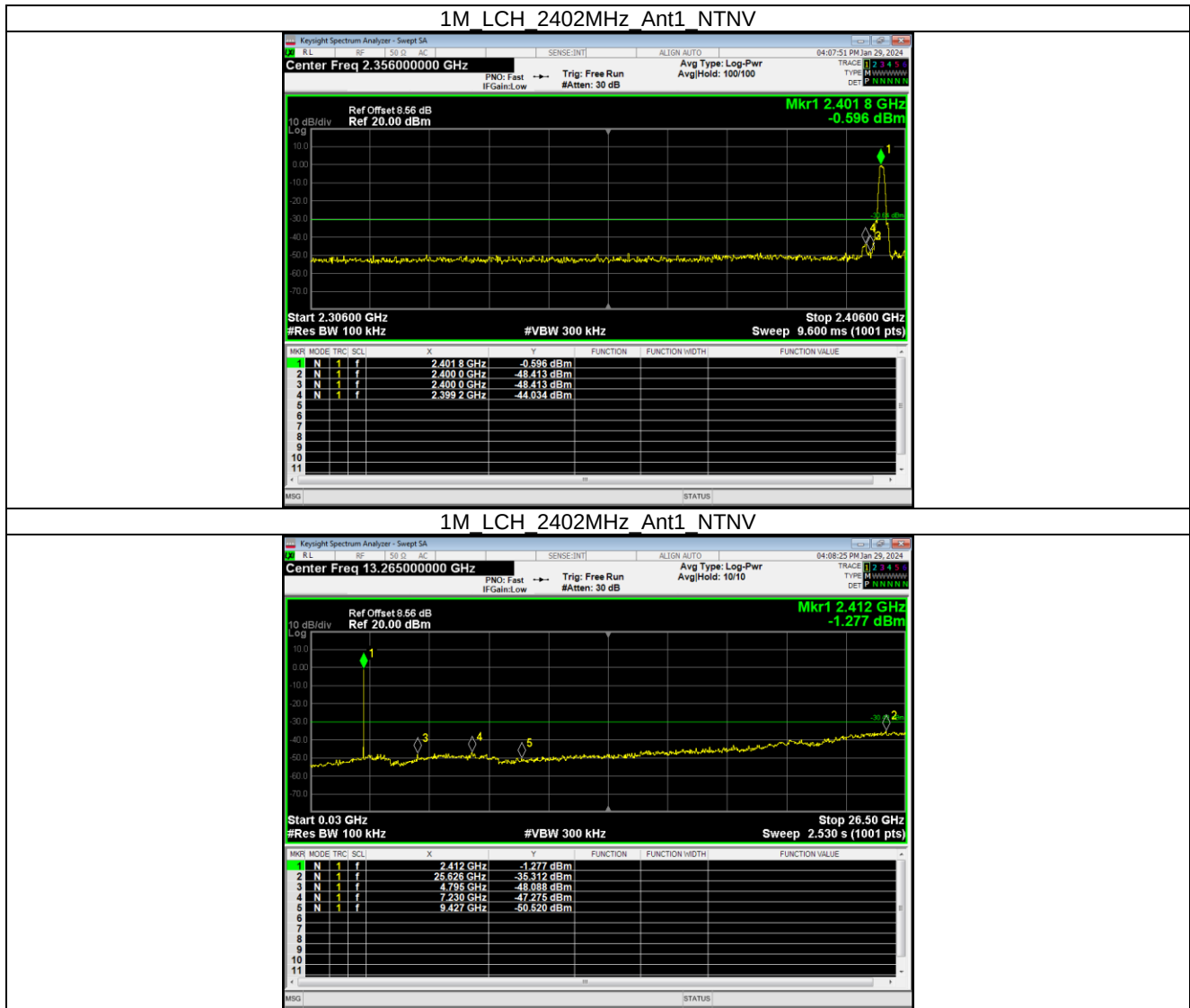


5.2 CSE

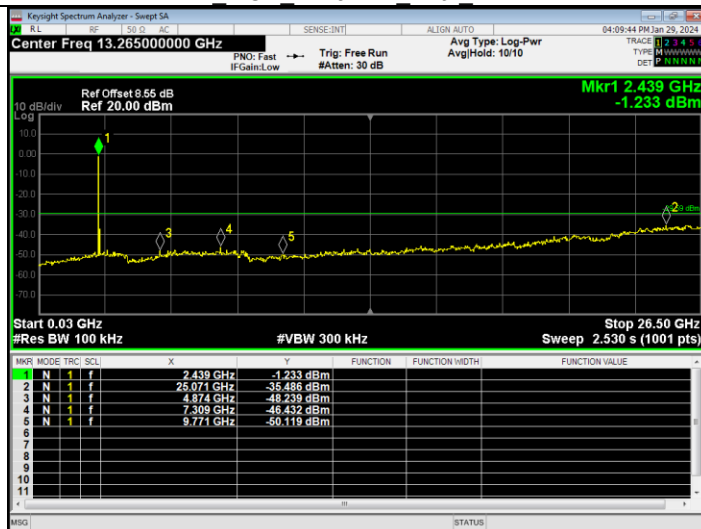
5.2.1 Test Result

Mode	TX Type	Frequency (MHz)	Verdict
1M	SISO	2402	Pass
		2440	Pass
		2480	Pass
2M	SISO	2402	Pass
		2440	Pass
		2480	Pass
Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.			

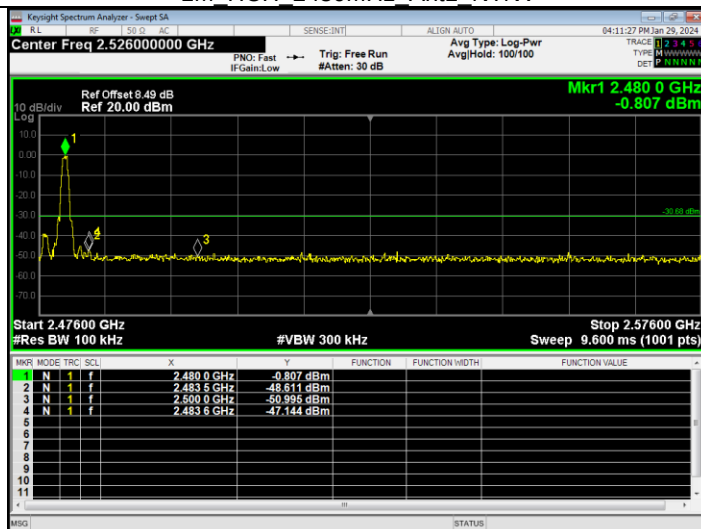
5.2.2 Test Graph



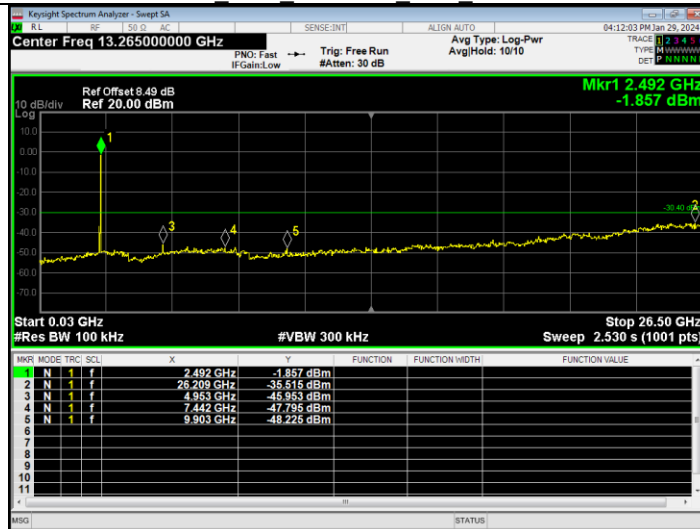
1M MCH 2440MHz Ant1 NTNv



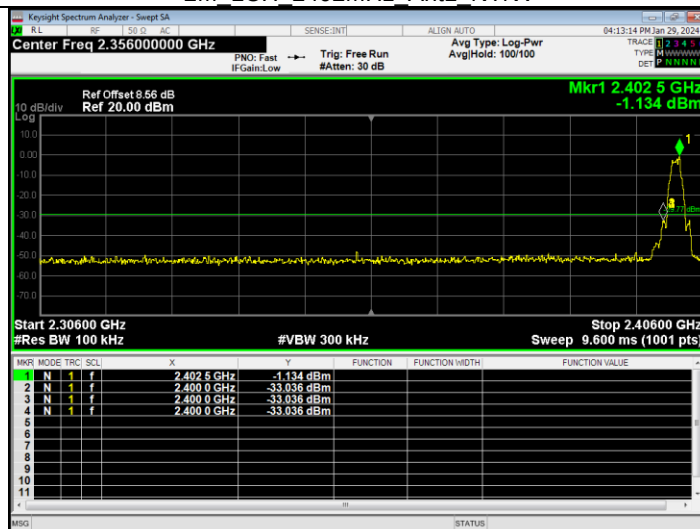
1M HCH 2480MHz Ant1 NTNv



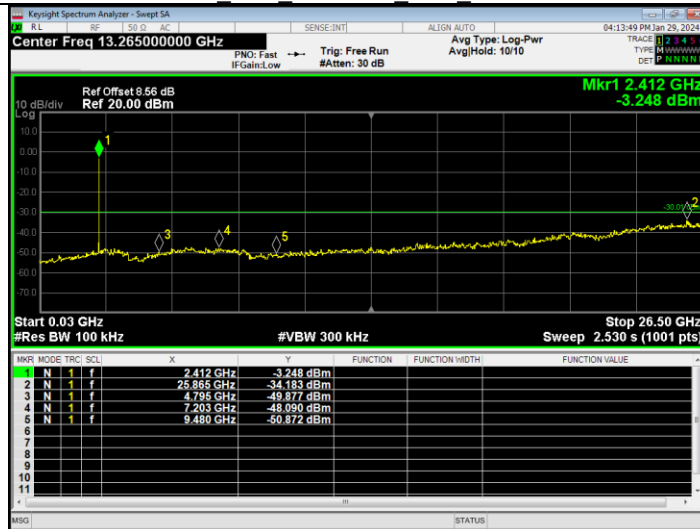
1M HCH 2480MHz Ant1 NTNv



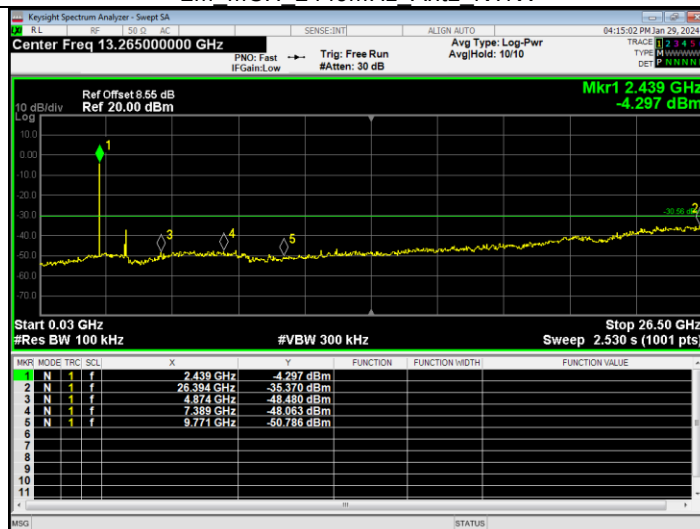
2M LCH 2402MHz Ant1 NTNv



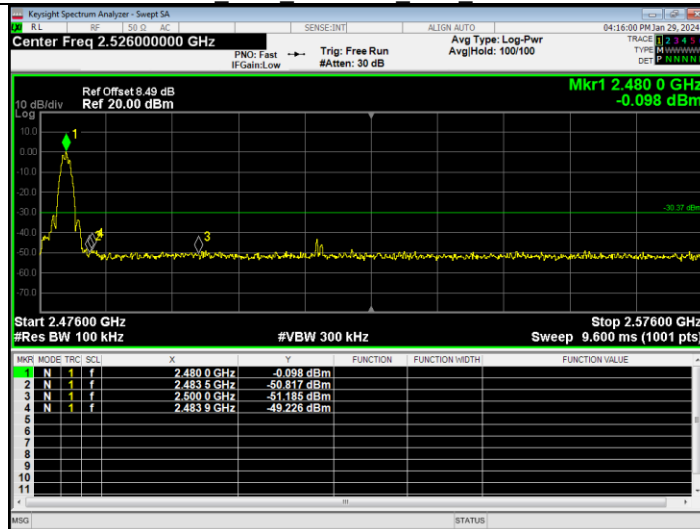
2M LCH 2402MHz Ant1 NTN



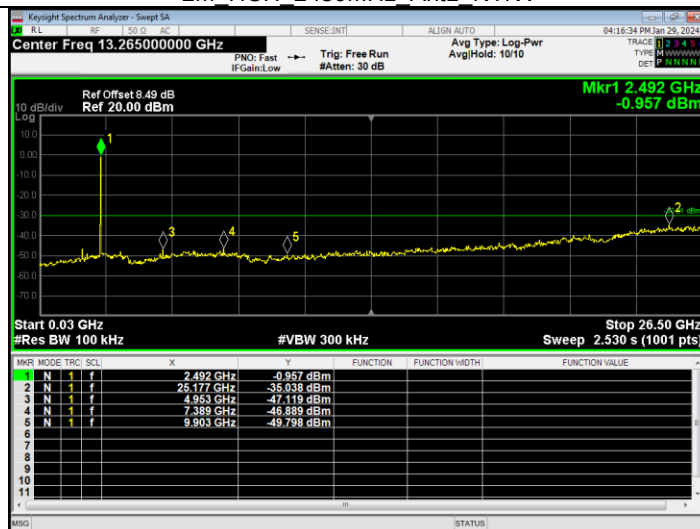
2M MCH 2440MHz Ant1 NTN



2M HCH 2480MHz Ant1 NTN



2M HCH 2480MHz Ant1 NTN





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-- END OF REPORT --