

TEST REPORT

Product : PowerEgg X 8K
Trade mark : PowerEgg™
Model/Type reference : PEX20
Serial Model : N/A
Report Number : EED39N80209403
FCC ID : 2AKBMPEX20
Date of Issue : August 6, 2021

Test Standards	Results
☒ 47 CFR Part 15 Subpart C	PASS

Prepared for:

Powervision Tech Inc.

**Zone E, Ocean Venture Valley, No.40, Yangguang Rd, Nanhai new District,
Weihai, Shandong, China. 264200**

Prepared by:

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August 6, 2021

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Modification Record

No.	Last Report No.	Modification Description
1	EED39N80209403	First report

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1. Test Summary

Test item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	N/A
Conducted Peak Output Power	47 CFR Part 15 Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013	PASS
Power Spectral Density	47 CFR Part 15 Subpart C Section 15.247 (e)	ANSI C63.10-2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15 Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15 Subpart C Section 15.247(d)	ANSI C63.10-2013	PASS
Duty cycle	47 CFR Part 15 Subpart C Section 15.35(c)	ANSI C63.10-2013	PASS
Radiated Spurious Emissions	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS

2. Test Requirement

2.1. Test Environment

Operating Environment:	
Temperature:	22.3 °C
Humidity:	48.7 % RH
Atmospheric Pressure:	1010mbar

2.2. Test Condition

Test Mode	Tx/Rx	RF Channel		
		Low(L)	Middle(M)	High(H)
Other	2406MHz ~2466 MHz	Channel 1	Channel 4	Channel7
		2406MHz	2436MHz	2466MHz
TX mode:	The EUT transmitted the continuous signal at the specific channel(s).			

3. General Information

3.1. Client Information

Applicant:	Powervision Tech Inc.
Address of Applicant:	Zone E,Ocean Venture Valley, No.40, Yangguang Rd, Nanhai new District, Weihai, Shandong,China. 264200
Manufacturer:	Powervision Tech Inc.
Address of Manufacturer:	Zone E,Ocean Venture Valley, No.40, Yangguang Rd, Nanhai new District, Weihai, Shandong,China. 264200
Factory:	Powervision (Suzhou) Technology Co.,Ltd.
Address of Factory:	Building 3,No.15, Zhujing Road,Changshu High-tech Industrial Development Zone,Suzhou,China

3.2. General Description of EUT

Product Name:	PowerEgg X 8K	
Model No.(EUT):	PEX20	
Serial Model:	/	
Trade Mark:		
EUT Supports Radios application:	2.4G WIFI: IEEE802.11b/g/n(20MHz), 2412MHz-2462MHz 5G WIFI: IEEE802.11a/an(HT20)5725-5850MHz. 2.4G: 2406MHz~2466MHz 5G:5740MHz~5830MHz	
Power Supply :	Adapter:	Model:PAD20 INPUT:100-240V 1.4A 50-60Hz OUTPUT:DC 13.3V 3.76A DC 5V 2A
	Battery:	Model: PEMIB10 Rated voltage:11.4V Rated capacity:3800mAh
Sample Received Date:	2021.05.14	
Sample tested Date:	2021.05.14 to 2021.08.05	

3.3. Product Specification subjective to this standard

Operation Frequency:	2406MHz to 2466MHz				
Channel Numbers:	7				
Channel Separation:	10MHz				
Type of Modulation:	BPSK/QPSK/16QAM/64QAM				
Test Software of EUT:	Artosyn8020PCTool (manufacturer declare)				
Antenna Type:	PCB antenna				
Antenna Gain ^① :	ANT1 Gain :0.25dBi ANT2 Gain :0.25dBi				
Test Voltage:	DC 3.3V				
Operation Frequency each of channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2406MHz	4	2436MHz	7	2466MHz

Note: 1 The antenna gain is provided by the client and we Centre Testing International (Suzhou) CO., LTD. test lab is not responsible for the accuracy of the antenna gain information.

3.4. Description of Support Units

The EUT has been tested with associated equipment below.

1) support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
NB	ThinkPad	E490	FCC ID and DOC	CTI

3.5. Test Location

All test facilities used to collect the test data are located at Building 18, Zhihui New Town Ecological Industrial Park, No. 1206, Jinyang East Road, Lujia Town, Kunshan, Jiangsu, China.

3.6. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

A2LA-Lab Cert. No. 5734.01

Centre Testing International (Suzhou) CO., LTD. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration. Laboratories and any additional program requirements in the identified field of testing.

FCC-Designation No.:CN1290

Centre Testing International Group Co., Ltd EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The American association for Centre Testing International Group Co., Ltd. EMC laboratory accreditation Designation No.:CN1290

3.7. Deviation from Standards

None.

3.8. Abnormalities from Standard Conditions

None.

3.9. Other Information Requested by the Customer

None.

3.10. Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Occupied Bandwidth	0.56%
2	RF Power conducted	0.59 dB
3	Power Spectral Density, conducted	2.37 dB
4	Unwanted Emission, conducted	2.68 dB
5	All Emission, radiated	4.41 dB(30MHz-1GHz)
		4.99 dB(1GHz-18GHz)
		5.307 dB(18GHz-40GHz)
6	Temperature test	0.54°C
7	Humidity test	1.62%
8	DC and low frequency voltages test	1.14%

4. Equipment List

RF test system					
Equipment	Manufacturer	Mode No.	Serial Number	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
Signal Generator	R&S	SMB100A	182002	2020-10-23	2021-10-22
Communication test set test set	R&S	CMW500	107929	2021-04-29	2022-04-28
Spectrum Analyzer	R&S	FSV40	101588	2020-10-23	2021-10-22
Vector signal generator	R&S	SMBV100B	101985	2020-10-23	2021-10-22
Temperature/ Humidity Indicator	testo	608-H1	1945222628	2020-11-09	2021-11-08
Switch Automatic control	R&S	OSP-B157W8	101111	2020-10-23	2021-10-22
High-low temperature chamber	GIANT FORCE	GTH-800-40-CP	MAA1908-003	2020-12-08	2021-12-07
Automatic test software	Shenzhen JS TONSCEND	/	V2.6.77.0518	/	/

966 Semi-anechoic Chamber					
Equipment	Manufacturer	Mode No.	Serial Number	Cal. Date (yyyy-mm-dd)	Cal. Due date (yyyy-mm-dd)
Receiver	R&S	ESU8	100537	2020-12-10	2021-12-09
Spectrum analyzer	R&S	FSV40	101185	2020-12-10	2021-12-09
Preamplifier (30MHz~1GHz)	SONOMA	317	393347	2020-12-04	2021-12-03
Preamplifier (1GHz~18GHz)	R&S	SCU-18D	1987397	2020-12-10	2021-12-09
Preamplifier (18GHz~40GHz)	/	MTLNA1804003 0235	12009007	2020-10-23	2021-10-22
Loop Antenna (9kHz~30MHz)	TESEQ	HLA6121	54575	2021-02-27	2022-02-26
Antenna (30MHz~1GHz)	SCHWARZBEC K	VULB9163	9163-965	2020-10-16	2021-10-15
Antenna (1GHz~18GHz)	R&S	HF907	102524	2020-12-15	2021-12-14
Antenna (18GHz~40GHz)	R&S	BBHA9170	1032	2020-10-23	2021-10-22
Band rejection filter	Xi'an xingbo	XBLBQ-DZA81	200827-1-02	/	/

5. Radio Technical Requirements Specification

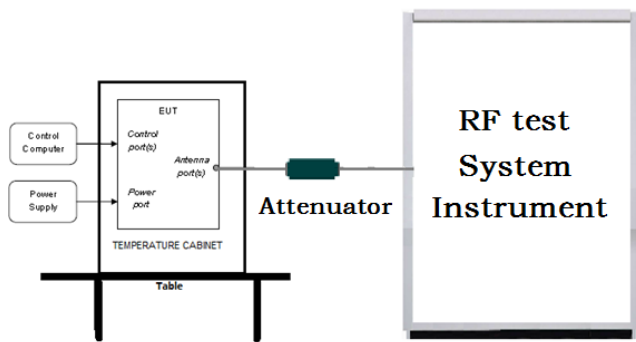
5.1. Reference Documents for Testing

No.	Identity	Document Title
1	FCC Part15C	Subpart C-Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

5.2. Test Results List

Test requirement	Test method	Test item	Verdict	Note
Part15C Section 15.247 (b)(3)	ANSI 63.10 (L,M,H CH)	Maximum conducted output power	PASS	Appendix A)
Part15C Section 15.247 (a)(2)	ANSI 63.10 (L,M,H CH)	DTS Bandwidth	PASS	Appendix B)
Part15C Section 15.247(d)	ANSI 63.10 (L, H CH)	Band-edge for RF Conducted Emissions	PASS	Appendix C)
Part15C Section 15.247(d)	ANSI 63.10(L,M,H CH)	RF Conducted Spurious Emissions	PASS	Appendix D)
Part15C Section 15.247 (e)	ANSI 63.10 (L,M,H CH)	Maximum Power Spectral Density	PASS	Appendix E)
Part15C Section 15.35 (c)	ANSI 63.10 (L or M or H CH)	Duty cycle	PASS	Appendix F)
Part15C Section 15.203/15.247 (c)	ANSI 63.10	Antenna Requirement	PASS	Appendix G)
Part15C Section 15.207	ANSI 63.10Transmitter mode	AC Power Line Conducted Emission	PASS	Appendix H)
Part15C Section 15.205/15.209	ANSI 63.10 (L,M, H CH)	Restricted bands around fundamental frequency (Radiated Emission)	PASS	Appendix I)
Part15C Section 15.205/15.209	ANSI 63.10 (L,M,H CH)	Radiated Spurious Emissions	PASS	Appendix J)

Appendix A): Maximum conducted output power

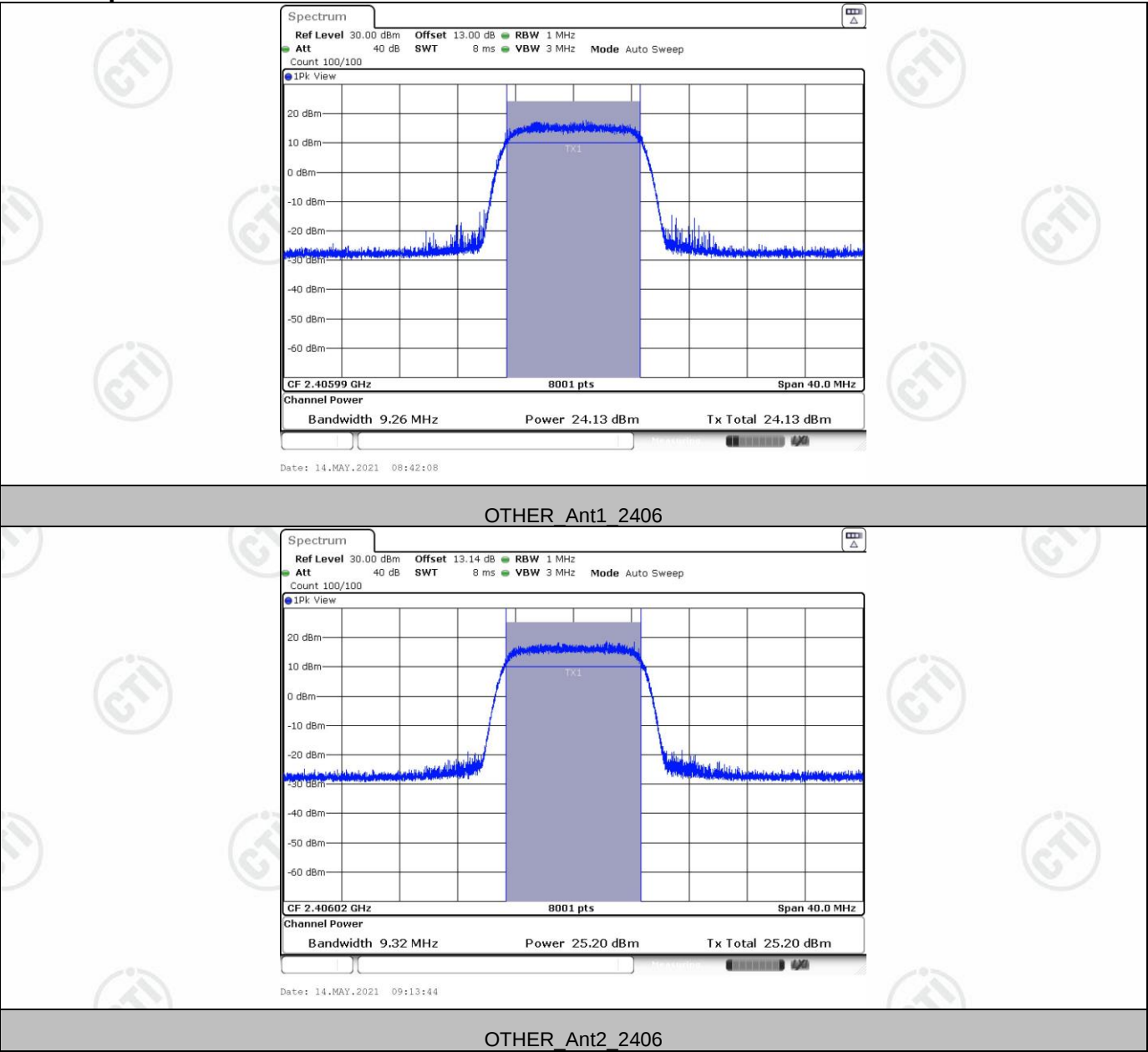
Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10 2013
Test Setup:	
Test Procedure:	1. PKPM1 Peak power meter measurement The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector. 2. Method AVGPM-G Average power measurement Method AVGPM-G is a measurement using a gated RF average power meter. Alternatively, measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Because the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.
Limit:	30dBm
Test Mode:	Refer to clause 2.2
Test Results:	Pass

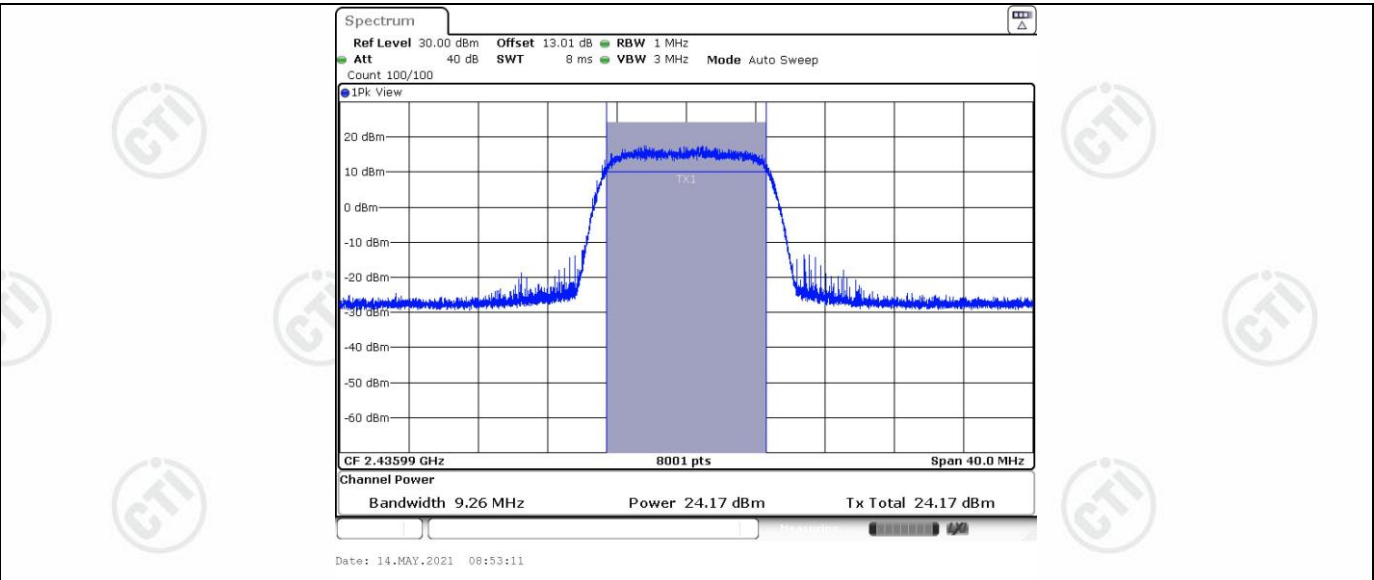
Report No. : EED39N80209403

Result Table:

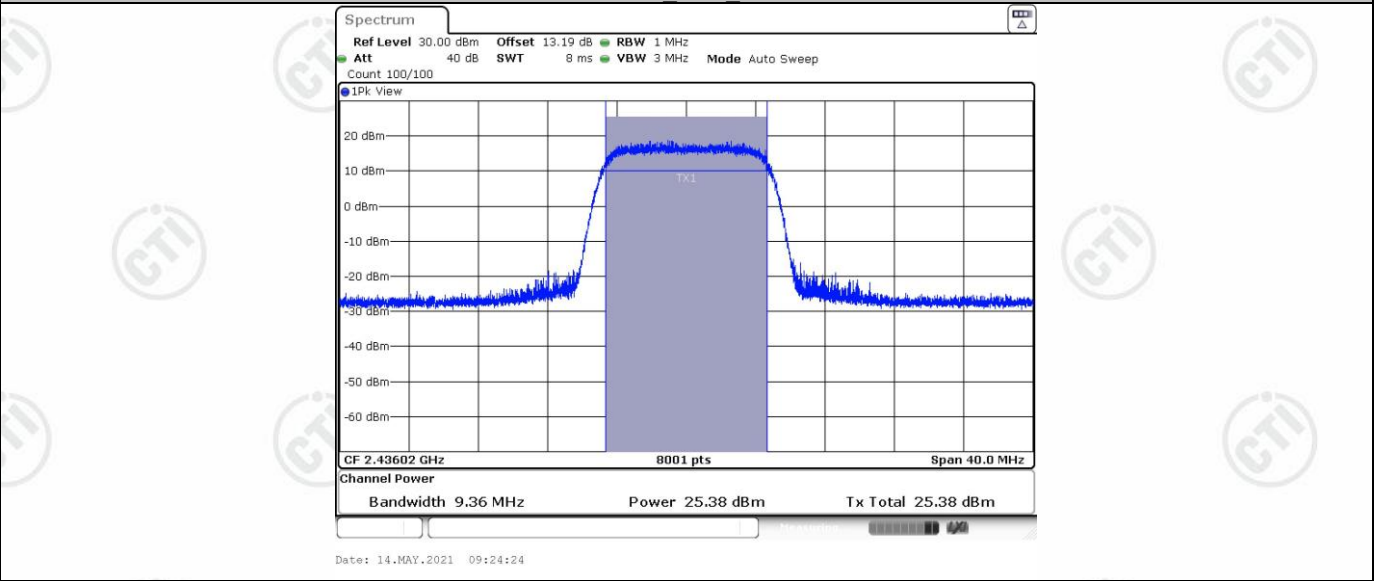
Test Mode	Antenna	Channel	Power[dBm]	Limit[dBm]	Verdict
OTHER	Ant1	2406	24.13	<=30	PASS
	Ant2	2406	25.20	<=30	PASS
	Ant1	2436	24.17	<=30	PASS
	Ant2	2436	25.38	<=30	PASS
	Ant1	2466	23.90	<=30	PASS
	Ant2	2466	25.03	<=30	PASS
	Total	2406	27.71	<=30	PASS
		2436	27.83	<=30	PASS
		2466	27.51	<=30	PASS

Test Graph:

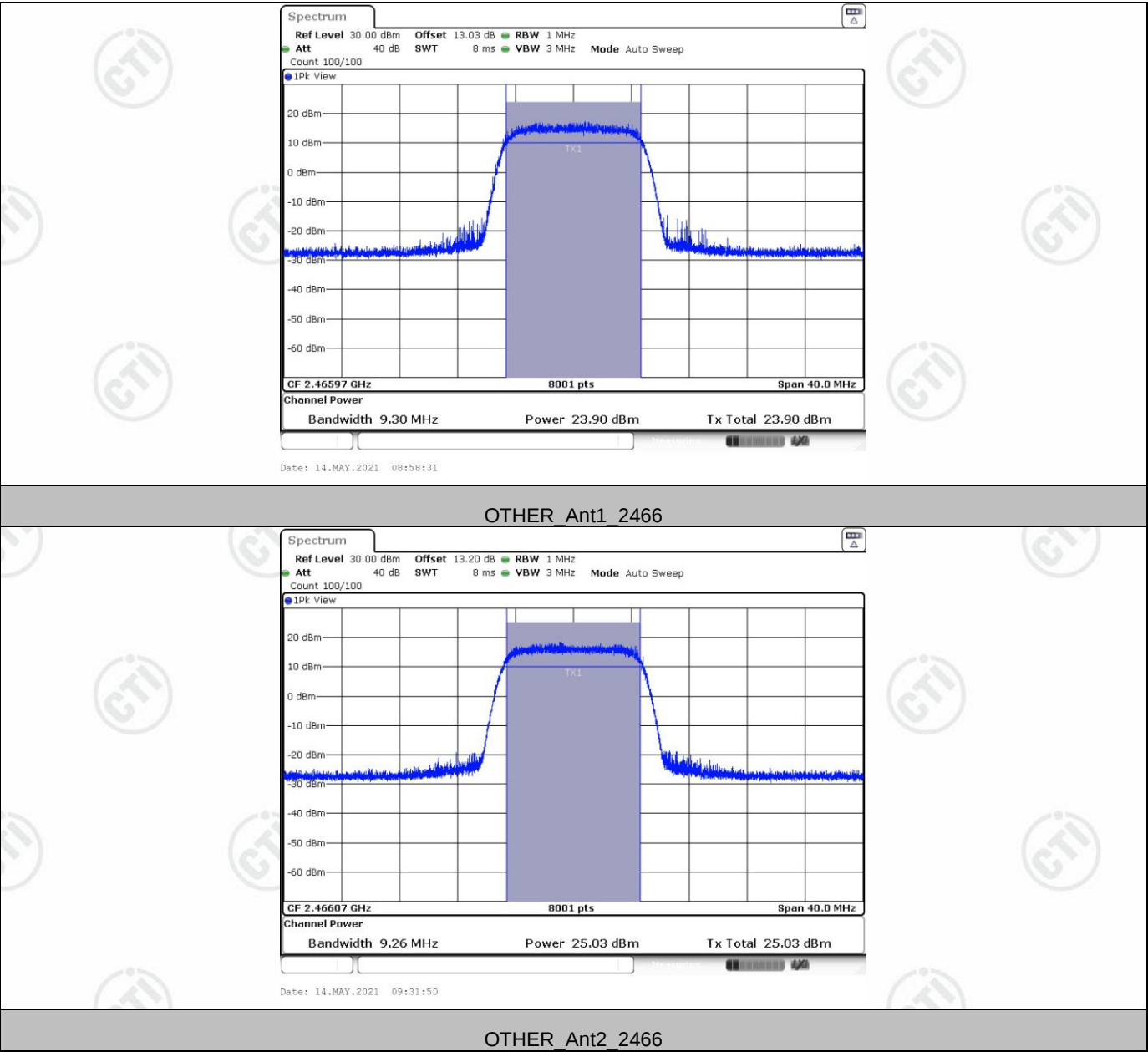




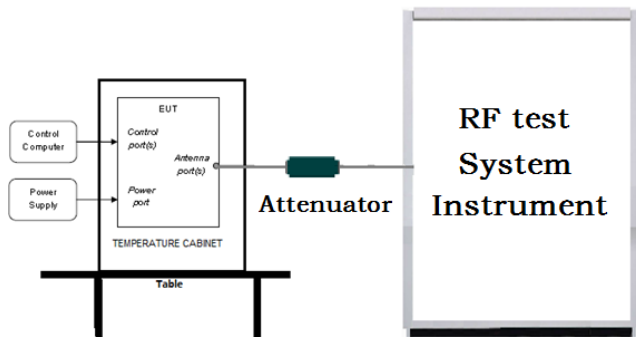
OTHER Ant1 2436



OTHER Ant2 2436



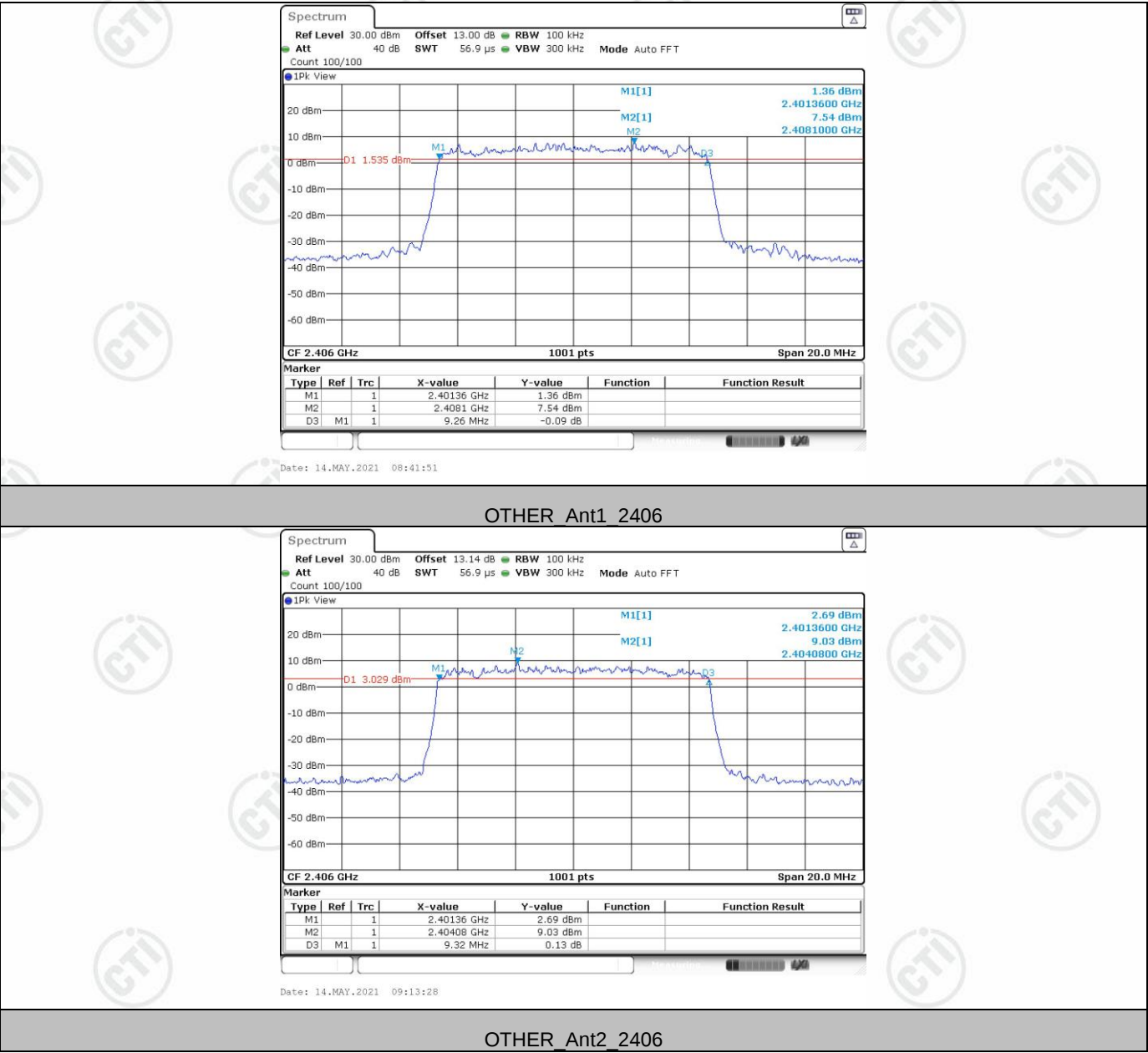
Appendix B): DTS Bandwidth

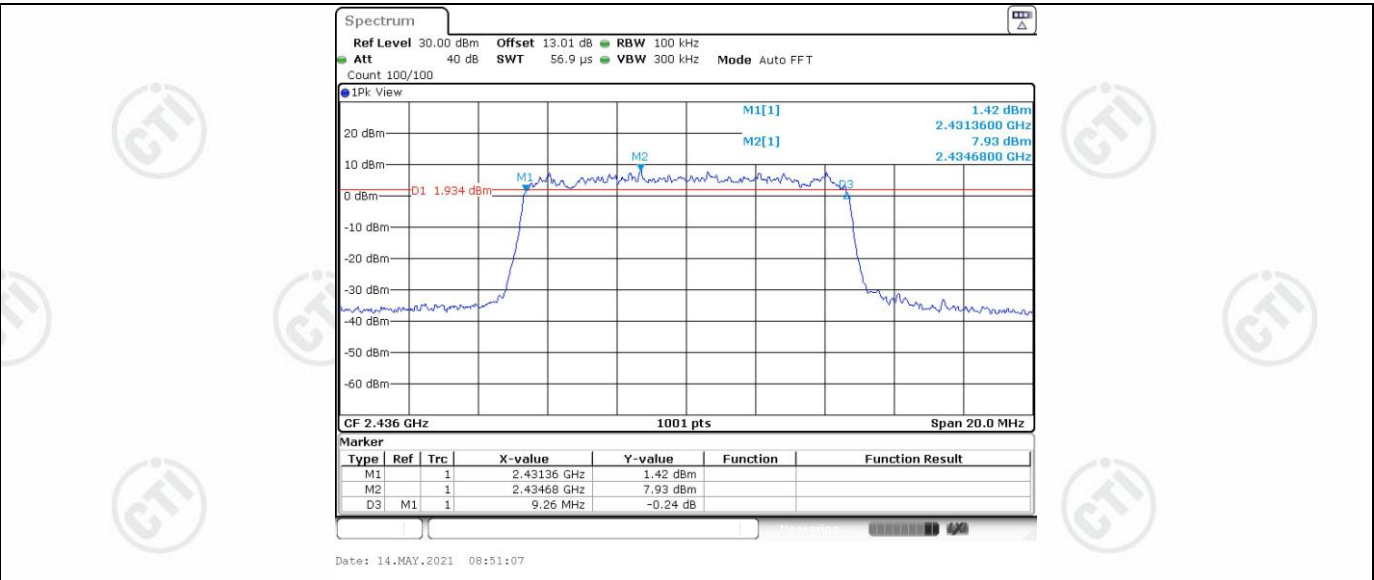
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10 2013
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Test Procedure:	a) Set RBW = 100 kHz. b) Set the VBW $\geq [3 \times \text{RBW}]$. c) Detector = peak. d) Trace mode = max hold. e) Sweep = auto couple. f) 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.
Limit:	$\geq 500 \text{ kHz}$
Test Mode:	Refer to clause 2.2
Test Results:	Pass

Result Table:

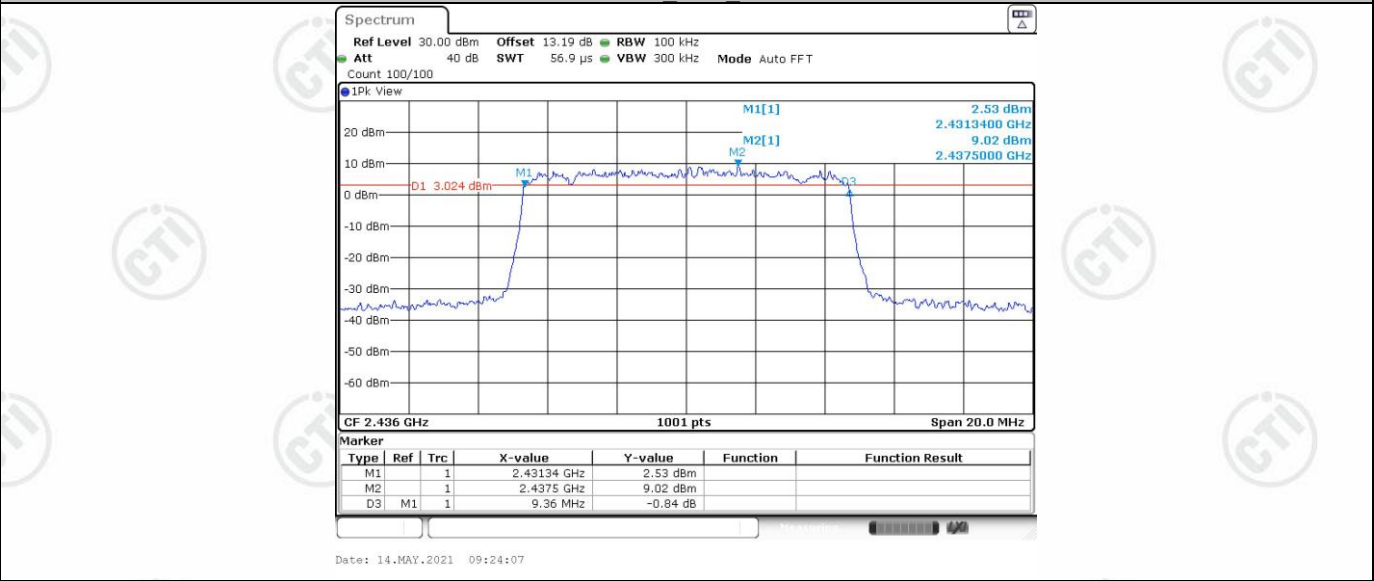
Test Mode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
OTHER	Ant1	2406	9.260	2401.360	2410.620	0.5	PASS
	Ant2	2406	9.320	2401.360	2410.680	0.5	PASS
	Ant1	2436	9.260	2431.360	2440.620	0.5	PASS
	Ant2	2436	9.360	2431.340	2440.700	0.5	PASS
	Ant1	2466	9.300	2461.320	2470.620	0.5	PASS
	Ant2	2466	9.260	2461.440	2470.700	0.5	PASS

Test Graph:

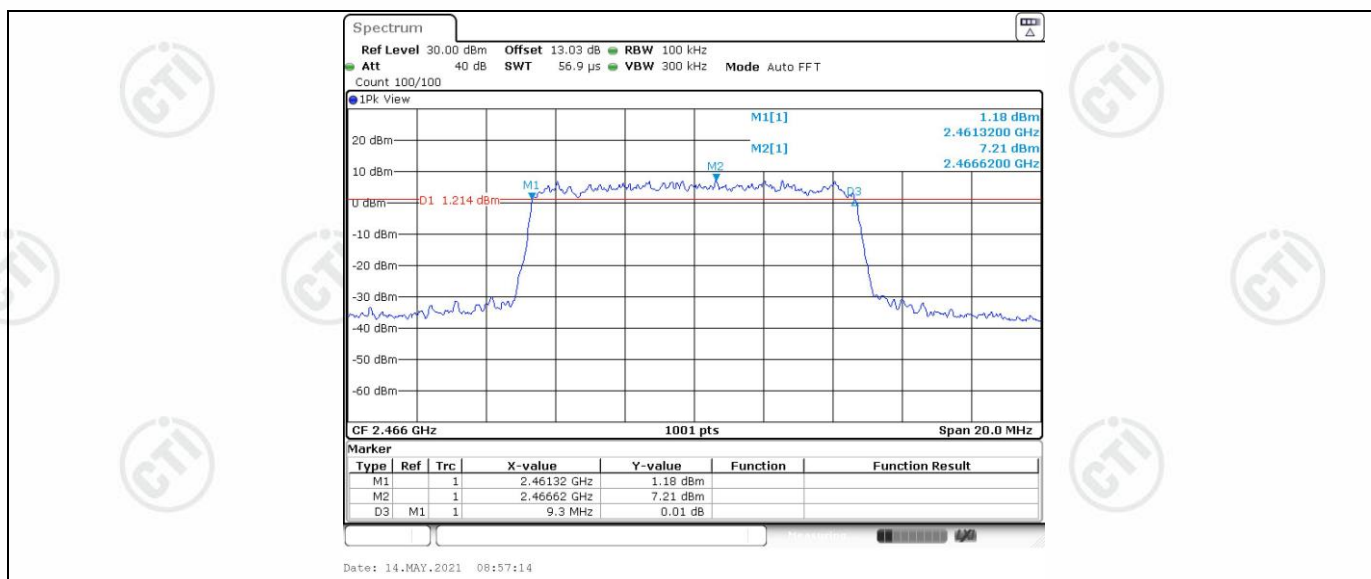




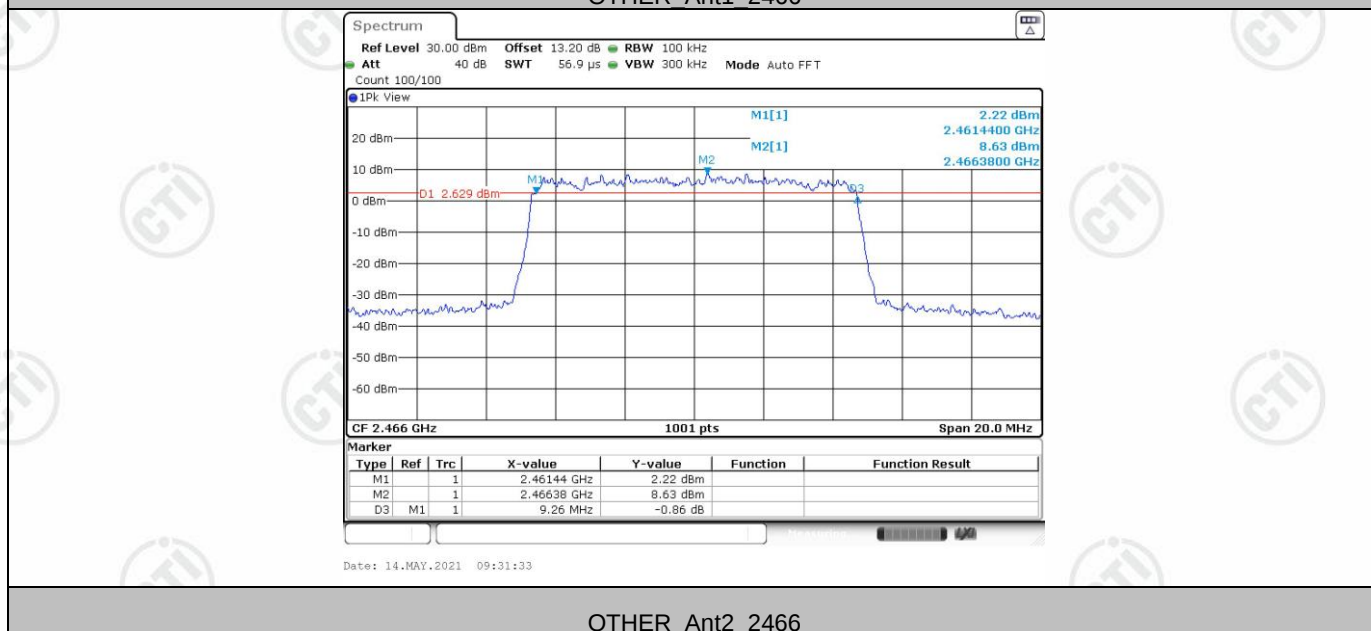
OTHER Ant1 2436



OTHER Ant2 2436

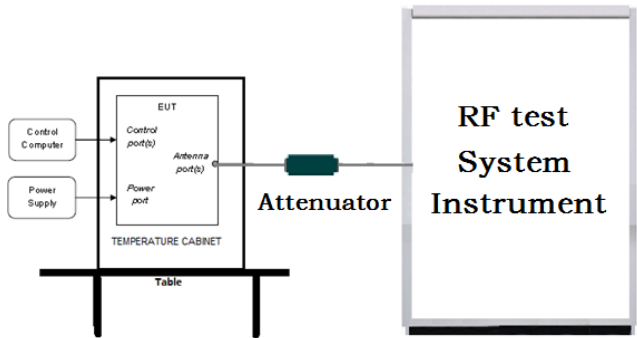


OTHER Ant1 2466



OTHER Ant2 2466

Appendix C): Band-edge for RF Conducted Emissions

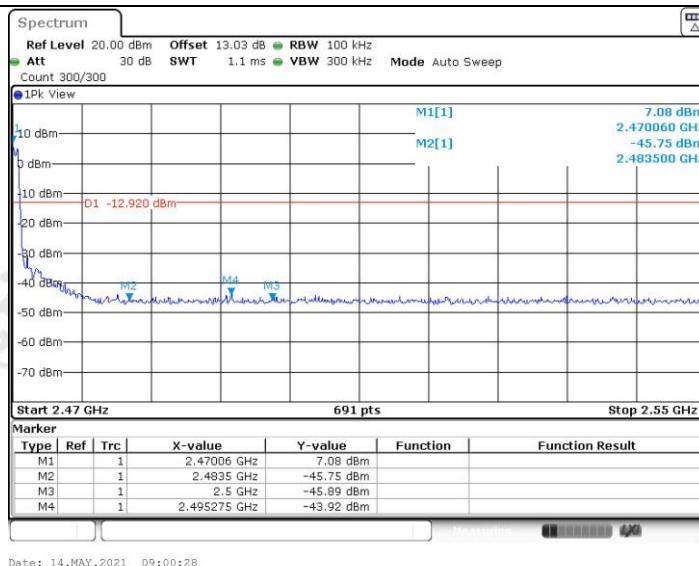
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10 2013
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Test Procedure:	a) Set RBW = 100KHz. b) Set VBW = 300KHz. c) Sweep time = auto couple. d) Detector = peak. e) Trace mode = max hold. f) Allow trace to fully stabilize. g) Use peak marker function to determine the peak amplitude level.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Mode:	Refer to clause 2.2
Test Results:	Pass

Result Table:

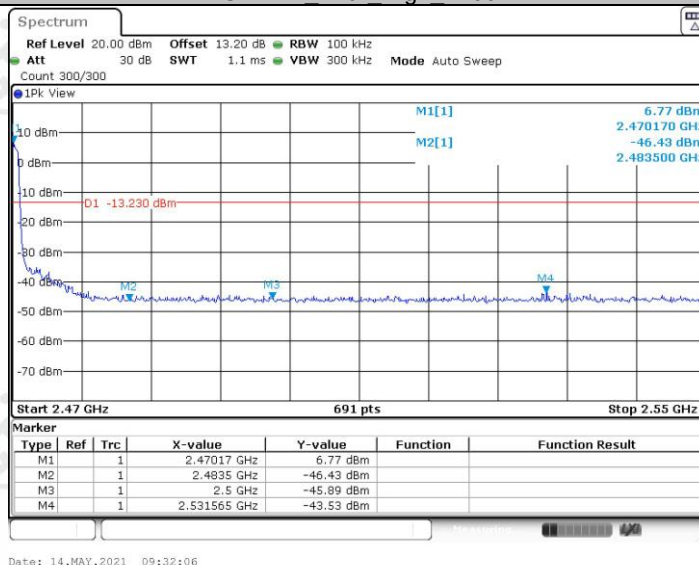
Test Mode	Antenna	Ch Name	Channel	Ref Level[dBm]	Result[dBm]	Limit[dBm]	Verdict
OTHER	Ant1	Low	2406	5.86	-35.8	<=-14.14	PASS
	Ant2	Low	2406	6.68	-37.48	<=-13.32	PASS
	Ant1	High	2466	7.08	-43.92	<=-12.92	PASS
	Ant2	High	2466	6.77	-43.53	<=-13.23	PASS
	Total	Low	2406	10.30	-34.06	<=-9.70	PASS
		High	2466	10.05	-52.58	<=-10.05	PASS

Test Graph:

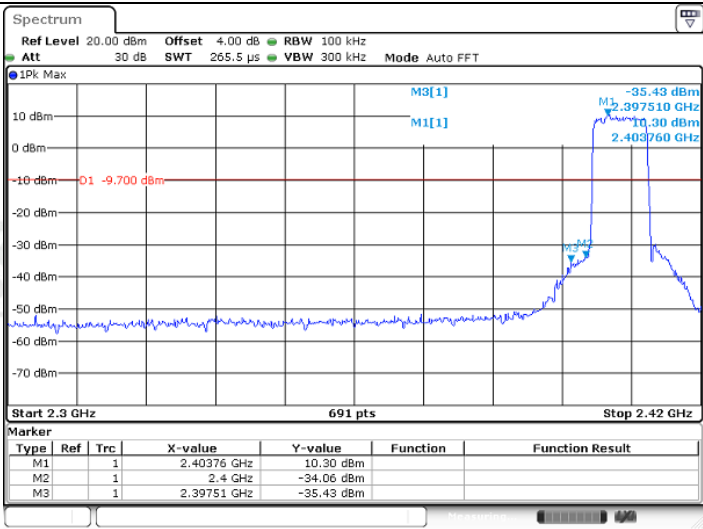




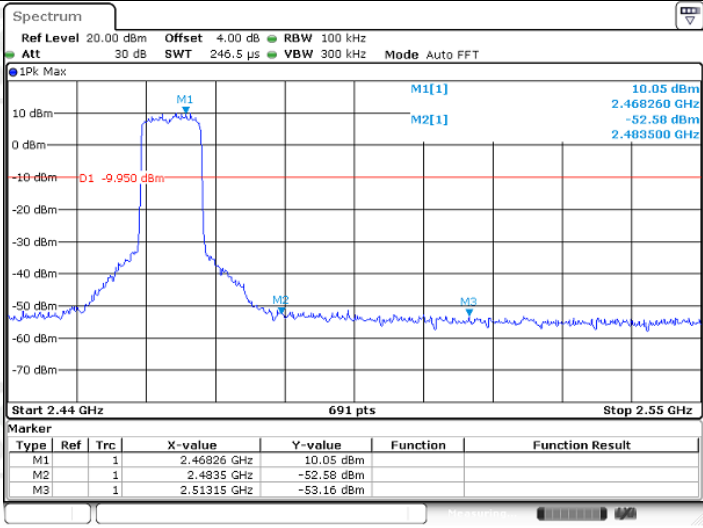
OTHER Ant1 High 2466



OTHER Ant2 High 2466

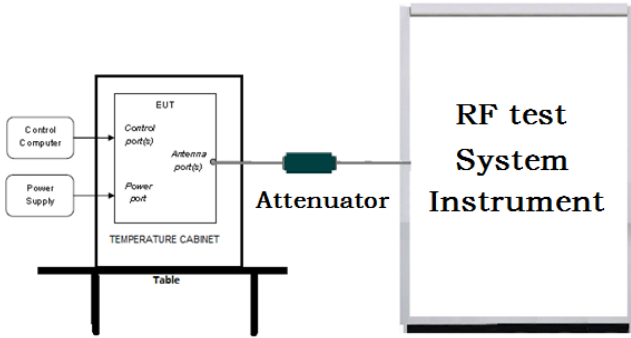


OTHER MIMO High 2406



OTHER MIMO High 2466

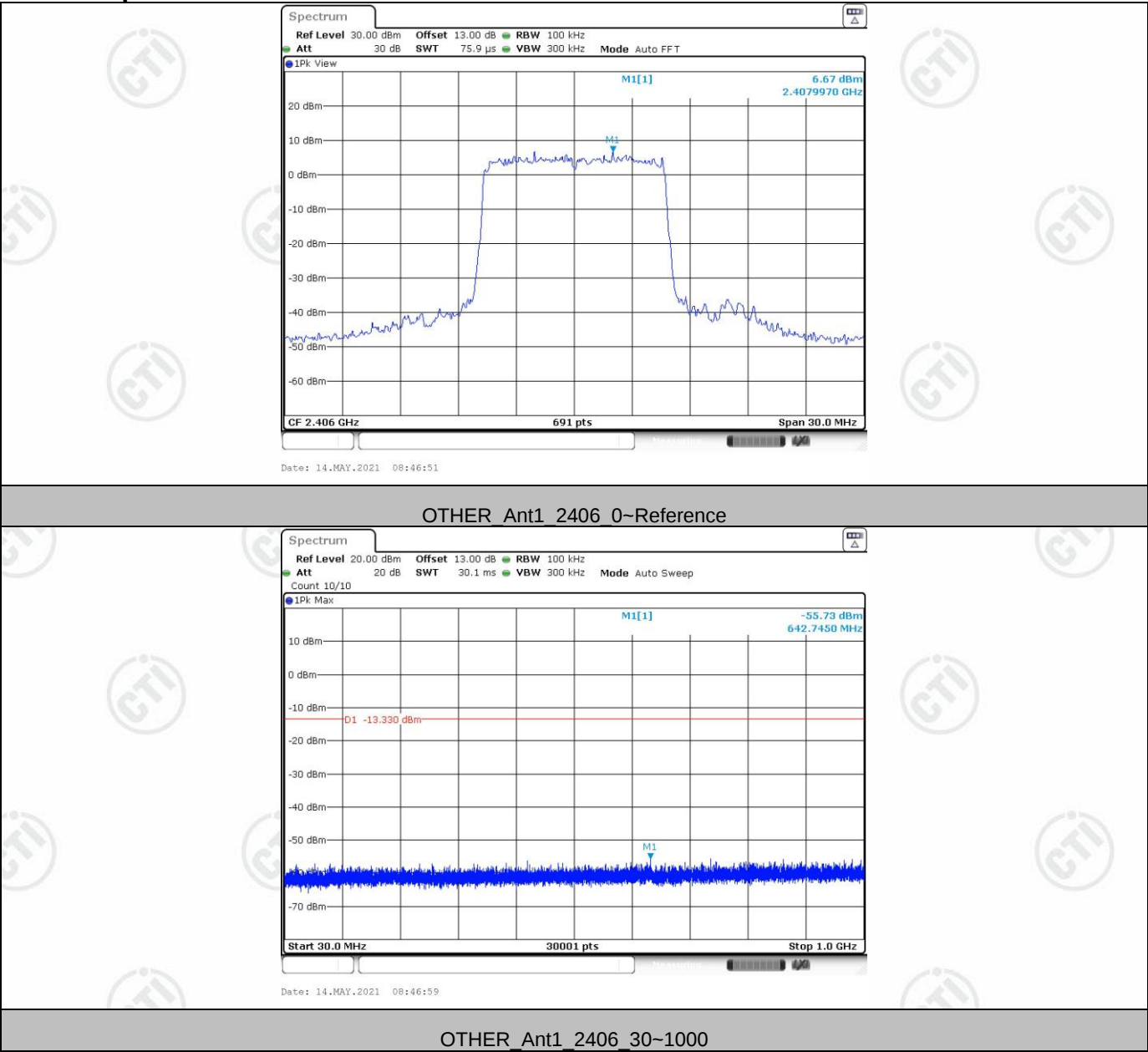
Appendix D): RF Conducted Spurious Emissions

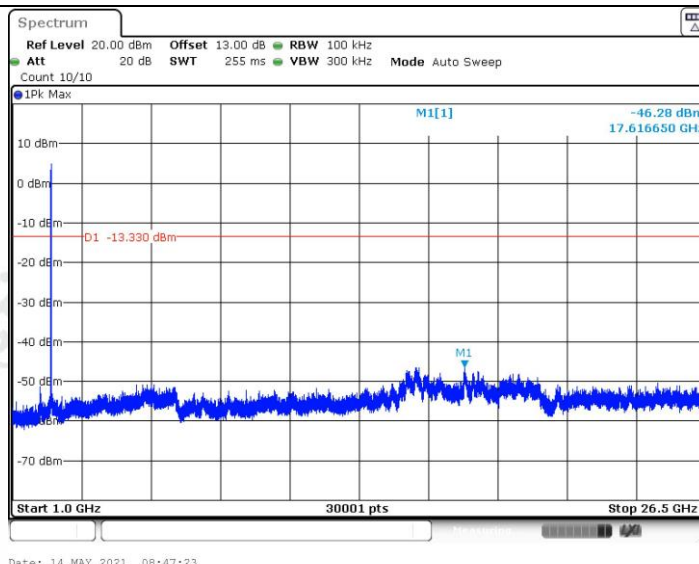
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10 2013
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Test Procedure:	a) Set RBW = 100KHz. b) Set VBW = 300KHz. c) Sweep time = auto couple. d) Detector = peak. e) Trace mode = max hold. f) Allow trace to fully stabilize. g) Use peak marker function to determine the peak amplitude level.
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.
Test Mode:	Refer to clause 2.2
Test Results:	Pass

Result Table:

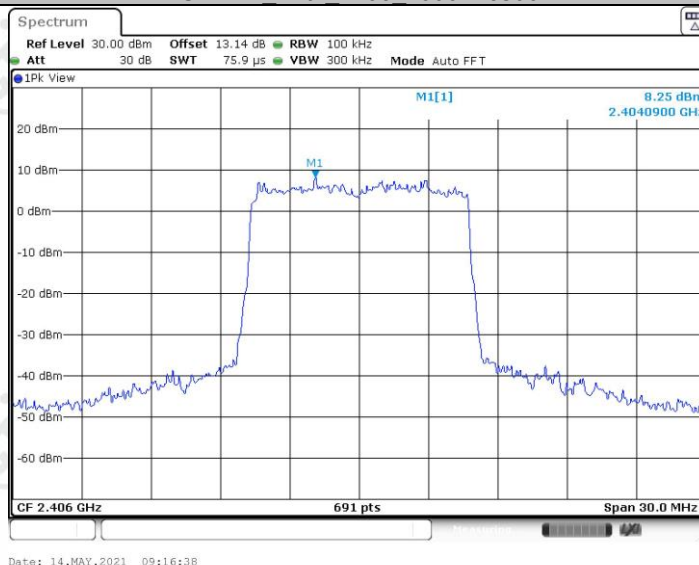
Test Mode	Antenna	Channel	Freq Range [Mhz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
OTHER	Ant1	2406	Reference	6.67	6.67	---	PASS
			30~1000	6.67	-55.73	≤ -13.33	PASS
			1000~26500	6.67	-46.28	≤ -13.33	PASS
	Ant2	2406	Reference	8.25	8.25	---	PASS
			30~1000	8.25	-55.35	≤ -11.75	PASS
			1000~26500	8.25	-46.29	≤ -11.75	PASS
	Ant1	2436	Reference	7.13	7.13	---	PASS
			30~1000	7.13	-55.63	≤ -12.87	PASS
			1000~26500	7.13	-44.65	≤ -12.87	PASS
	Ant2	2436	Reference	7.93	7.93	---	PASS
			30~1000	7.93	-55.77	≤ -12.07	PASS
			1000~26500	7.93	-45.7	≤ -12.07	PASS
	Ant1	2466	Reference	7.09	7.09	---	PASS
			30~1000	7.09	-55.92	≤ -12.91	PASS
			1000~26500	7.09	-45.01	≤ -12.91	PASS
	Ant2	2466	Reference	7.51	7.51	---	PASS
			30~1000	7.51	-54.92	≤ -12.49	PASS
			1000~26500	7.51	-46.25	≤ -12.49	PASS
	Total	2406	Reference	10.59	10.59	---	PASS
			30~1000	10.59	-53.88	≤ -9.41	PASS
			1000~26500	10.59	-46.30	≤ -9.41	PASS
		2436	Reference	10.91	10.91	---	PASS
			30~1000	10.91	-53.96	≤ -9.09	PASS
			1000~26500	10.91	-45.68	≤ -9.09	PASS
		2466	Reference	10.70	10.70	---	PASS
			30~1000	10.70	-54.00	≤ -9.30	PASS
			1000~26500	10.70	-45.87	≤ -9.30	PASS

Test Graph:

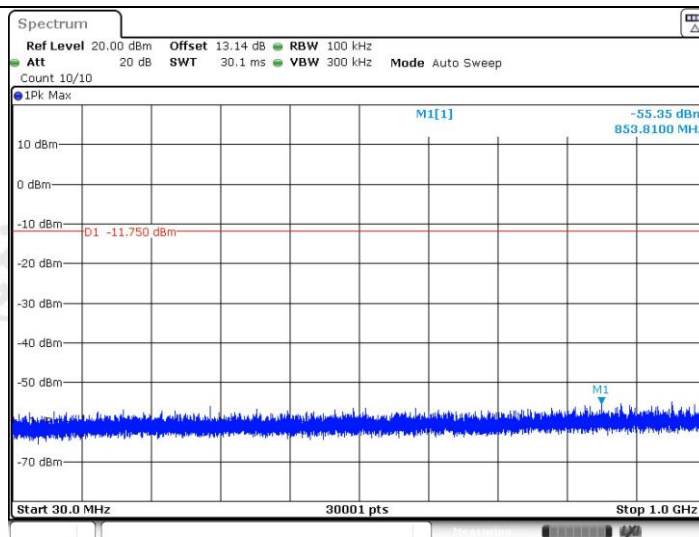




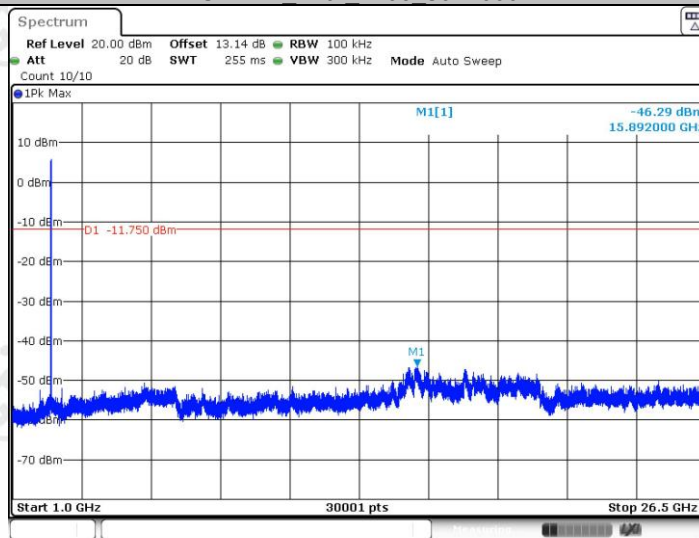
OTHER Ant1 2406 1000~26500



OTHER Ant2 2406 0~Reference

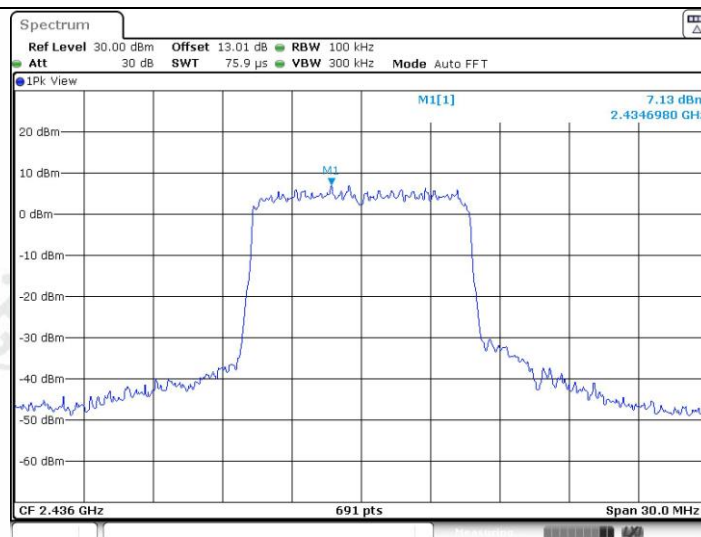


OTHER Ant2 2406 30~1000



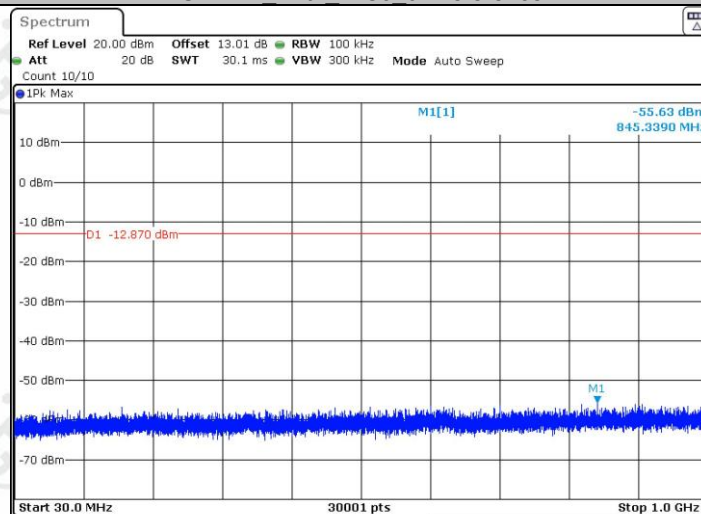
OTHER Ant2 2406 1000~26500

Report No. : EED39N80209403



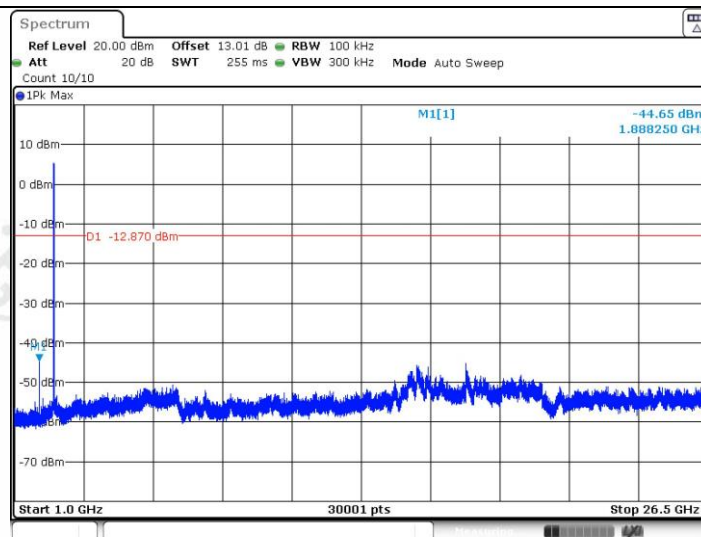
Date: 14.MAY.2021 08:51:36

OTHER Ant1 2436 0~Reference



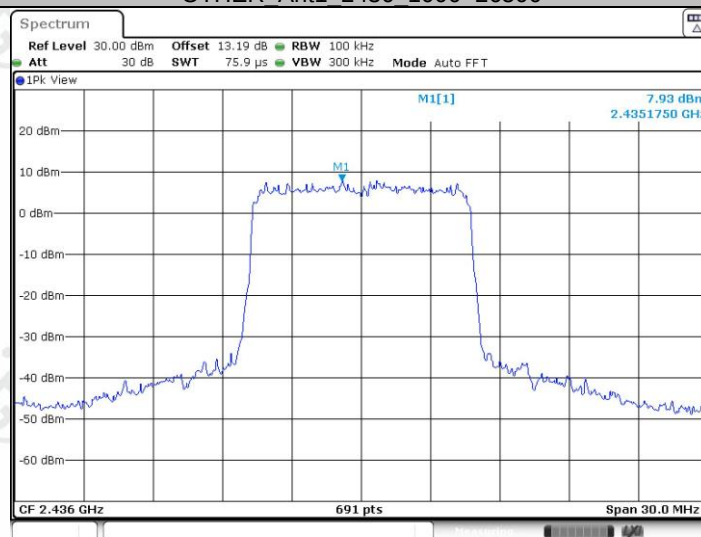
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OTHER Ant1 2436 30~1000



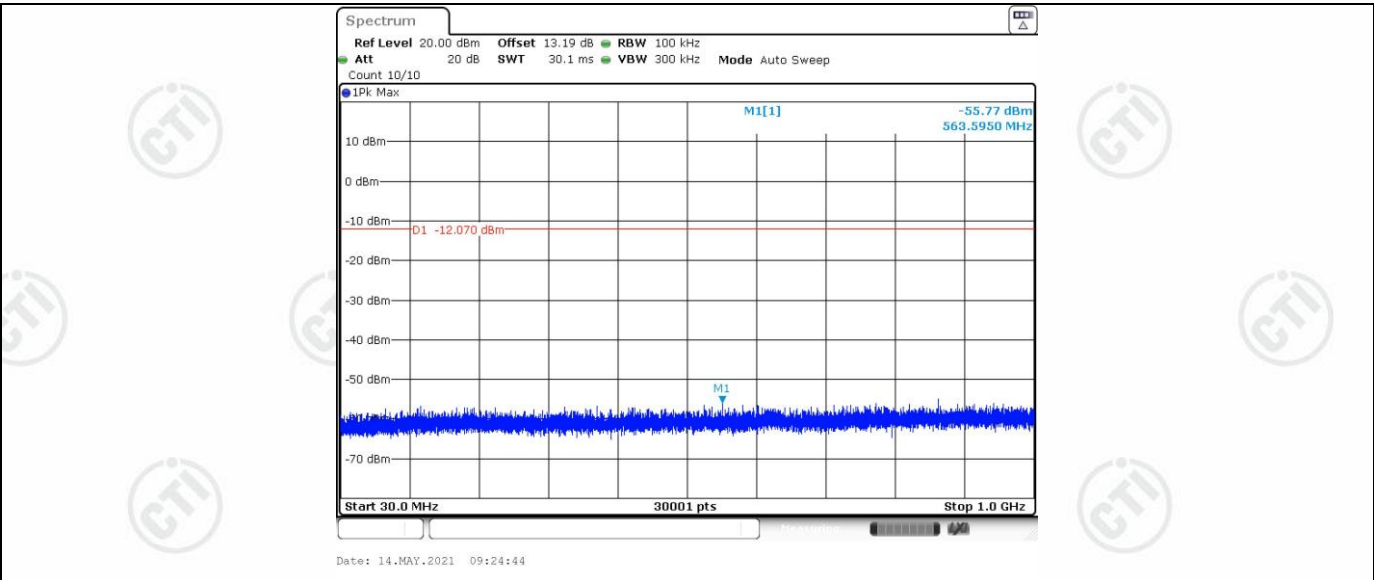
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OTHER Ant1 2436 1000~26500

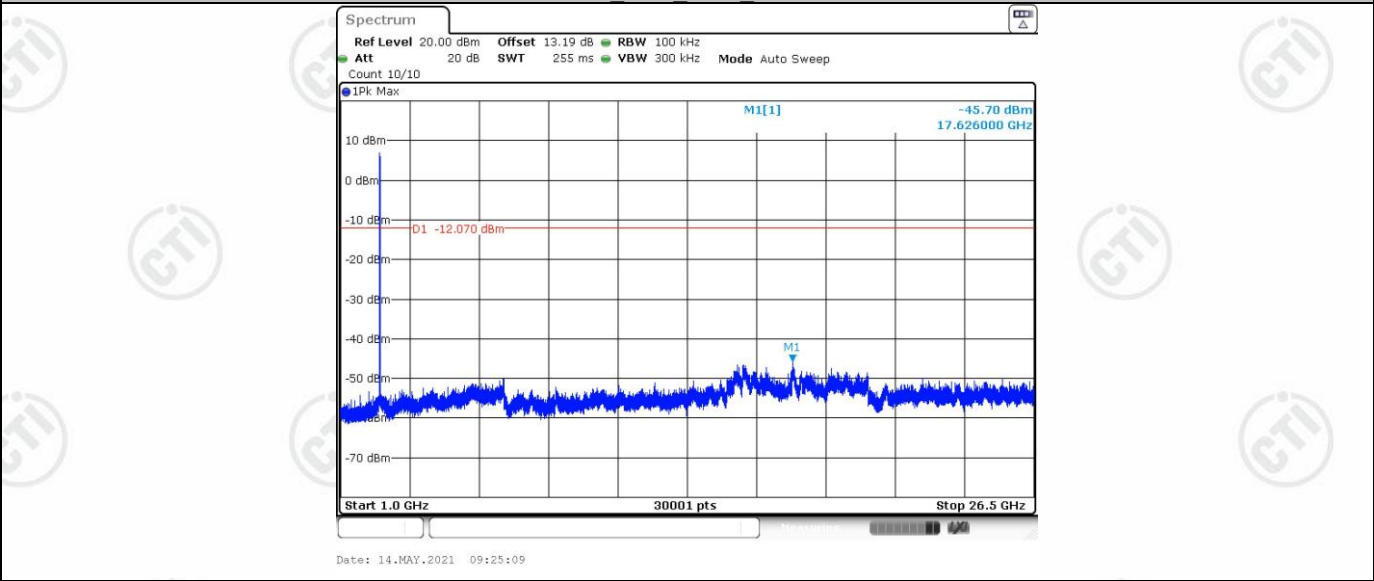


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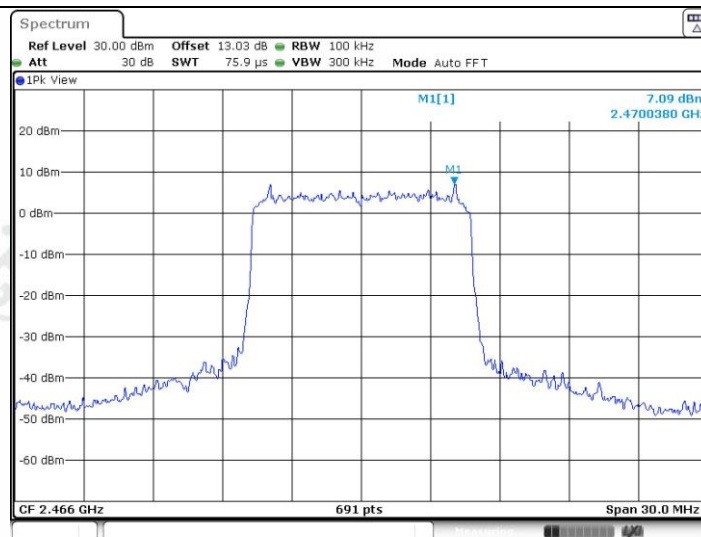
OTHER Ant2 2436 0~Reference



OTHER Ant2 2436 30~1000

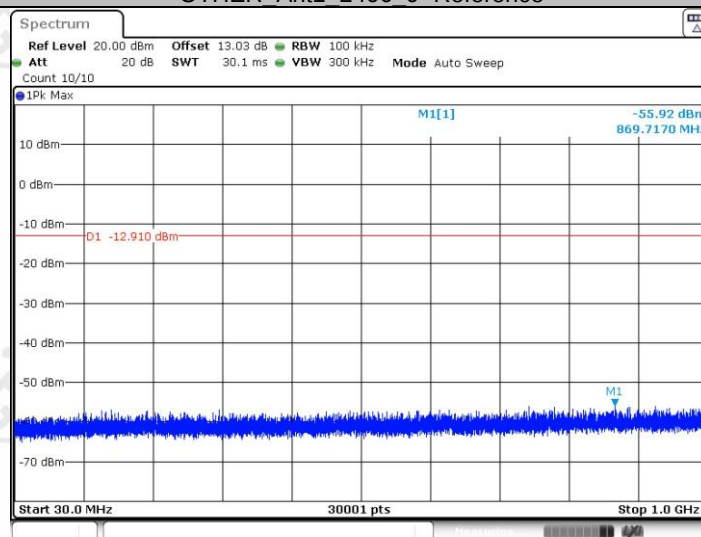


OTHER Ant2 2436 1000~26500



Date: 14.MAY.2021 09:02:39

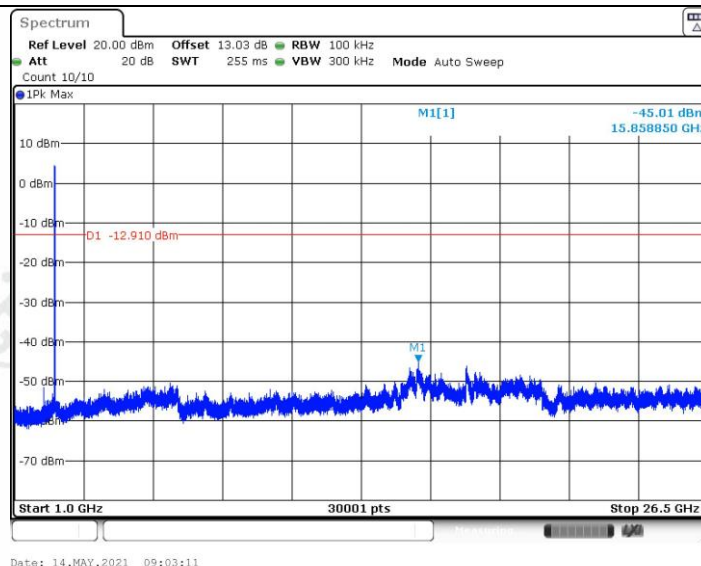
OTHER Ant1 2466 0~Reference



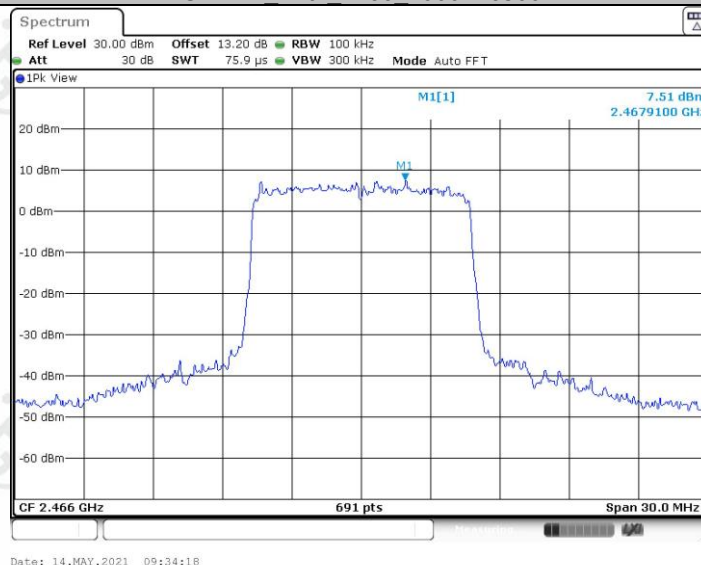
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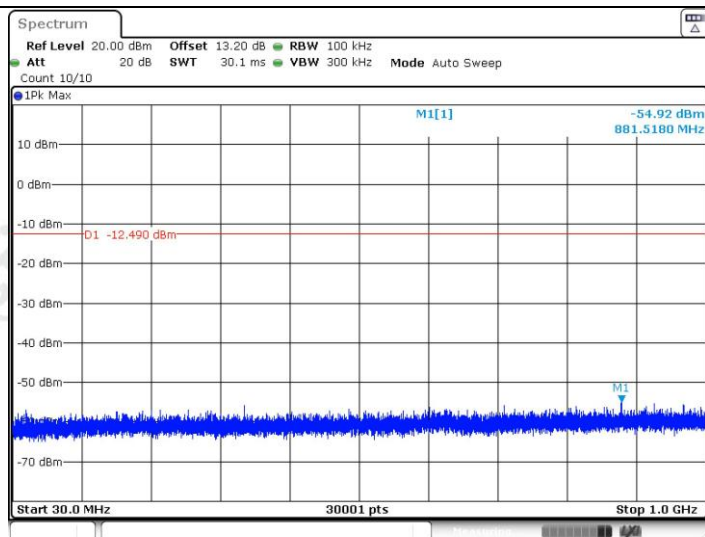
Report No. : EED39N80209403



OTHER Ant1 2466 1000~26500

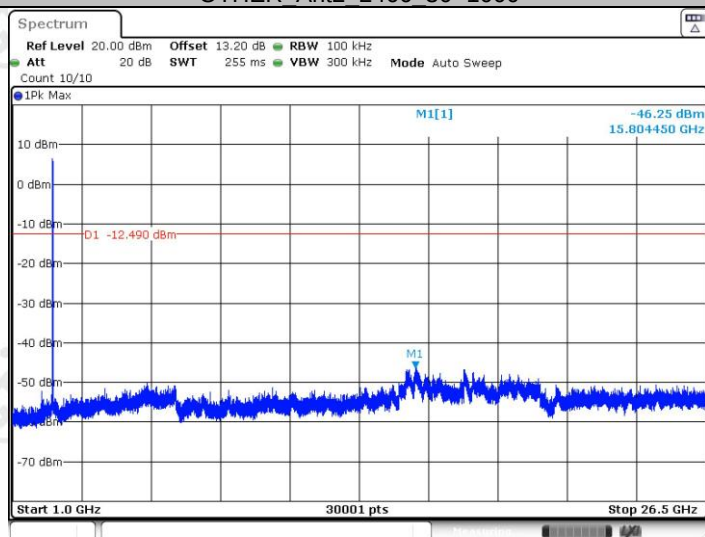


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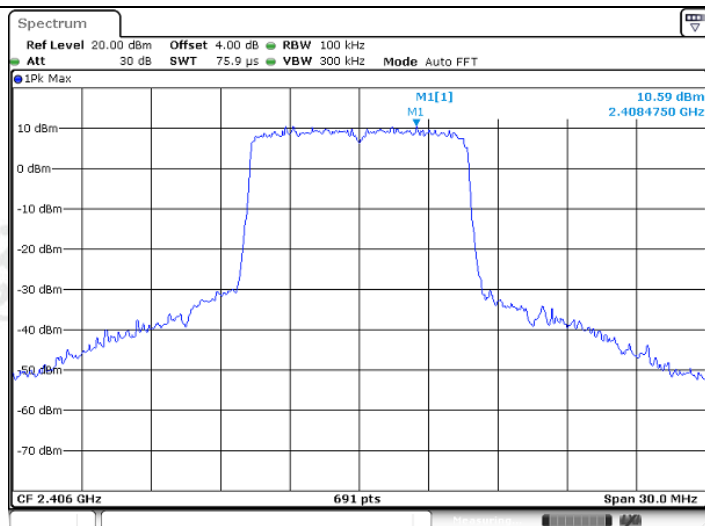
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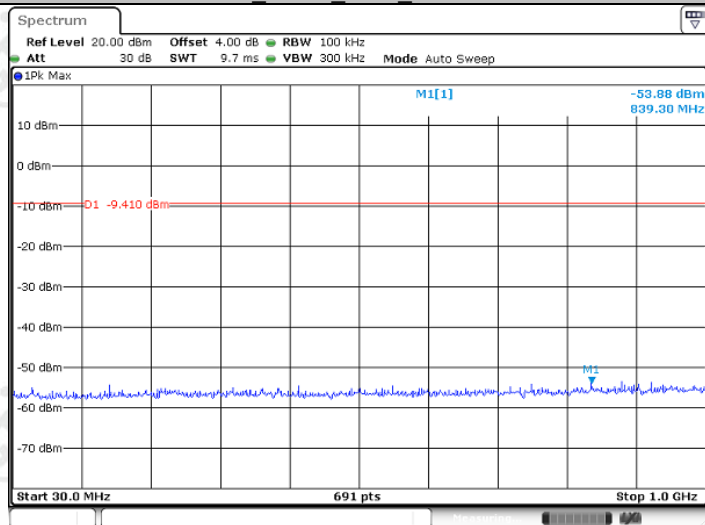


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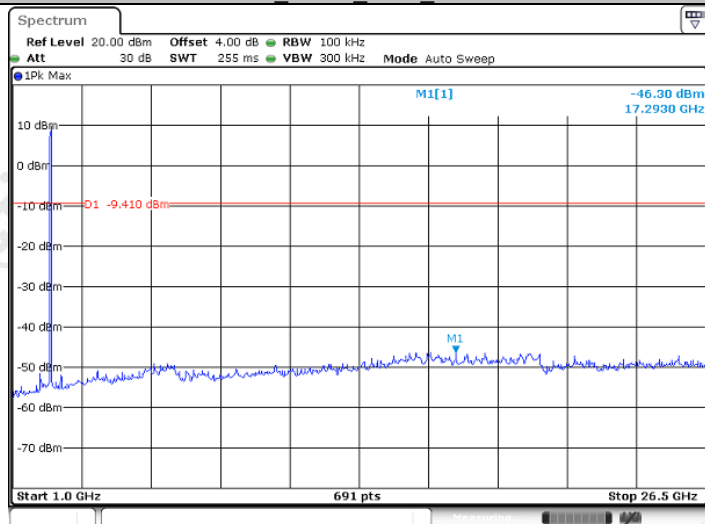
OTHER Ant2 2466 1000~26500



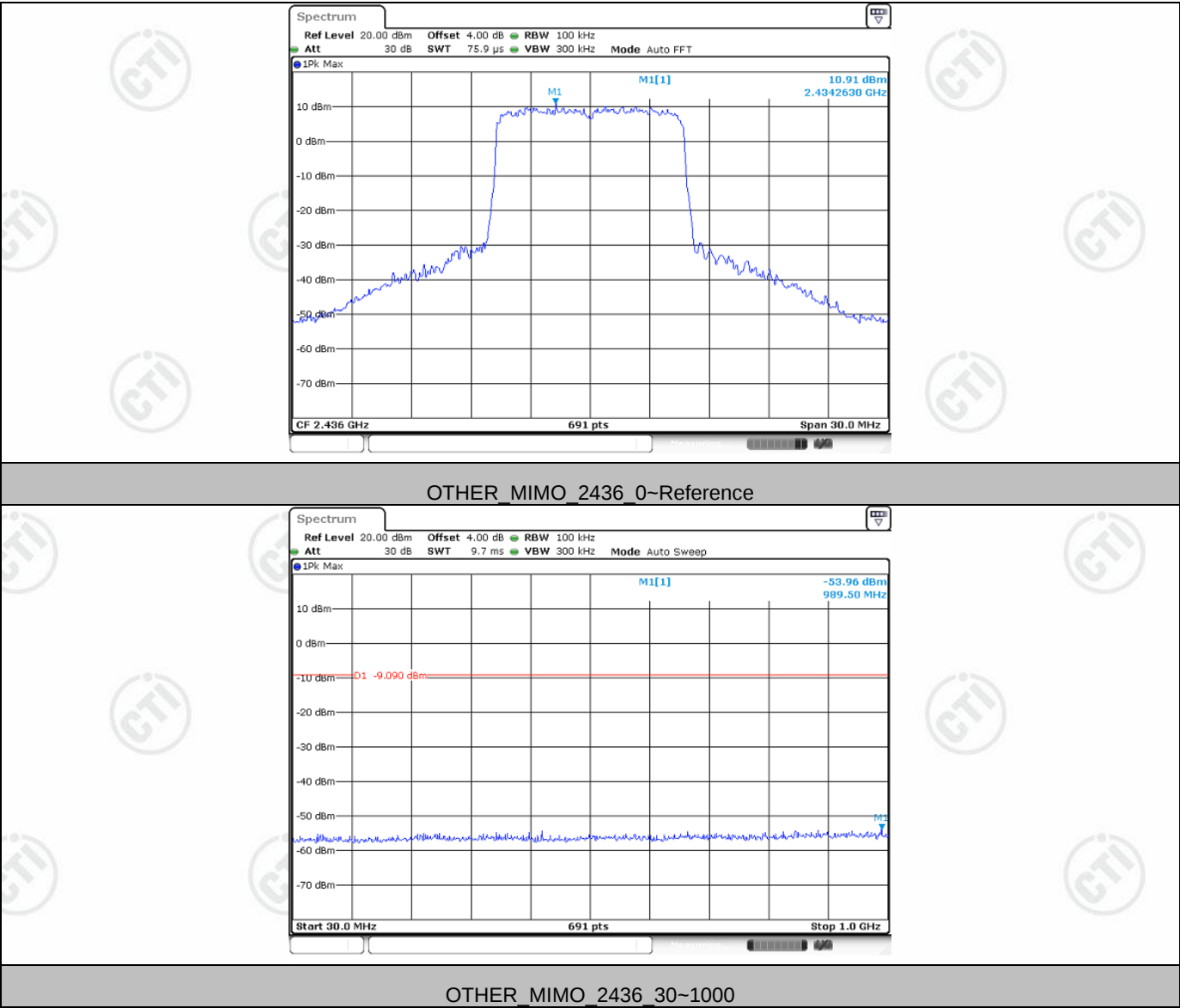
OTHER_MIMO_2406_0~Reference

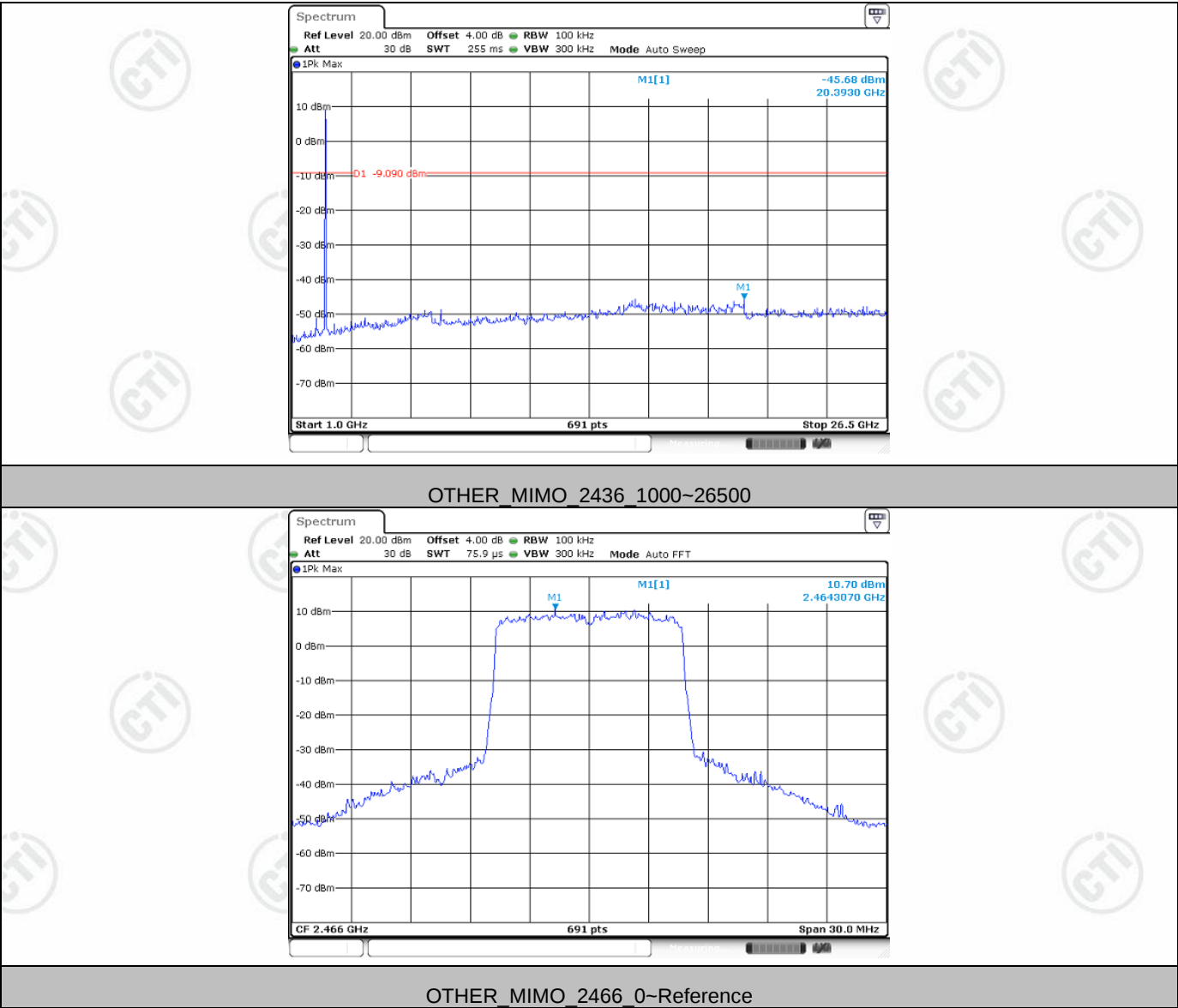


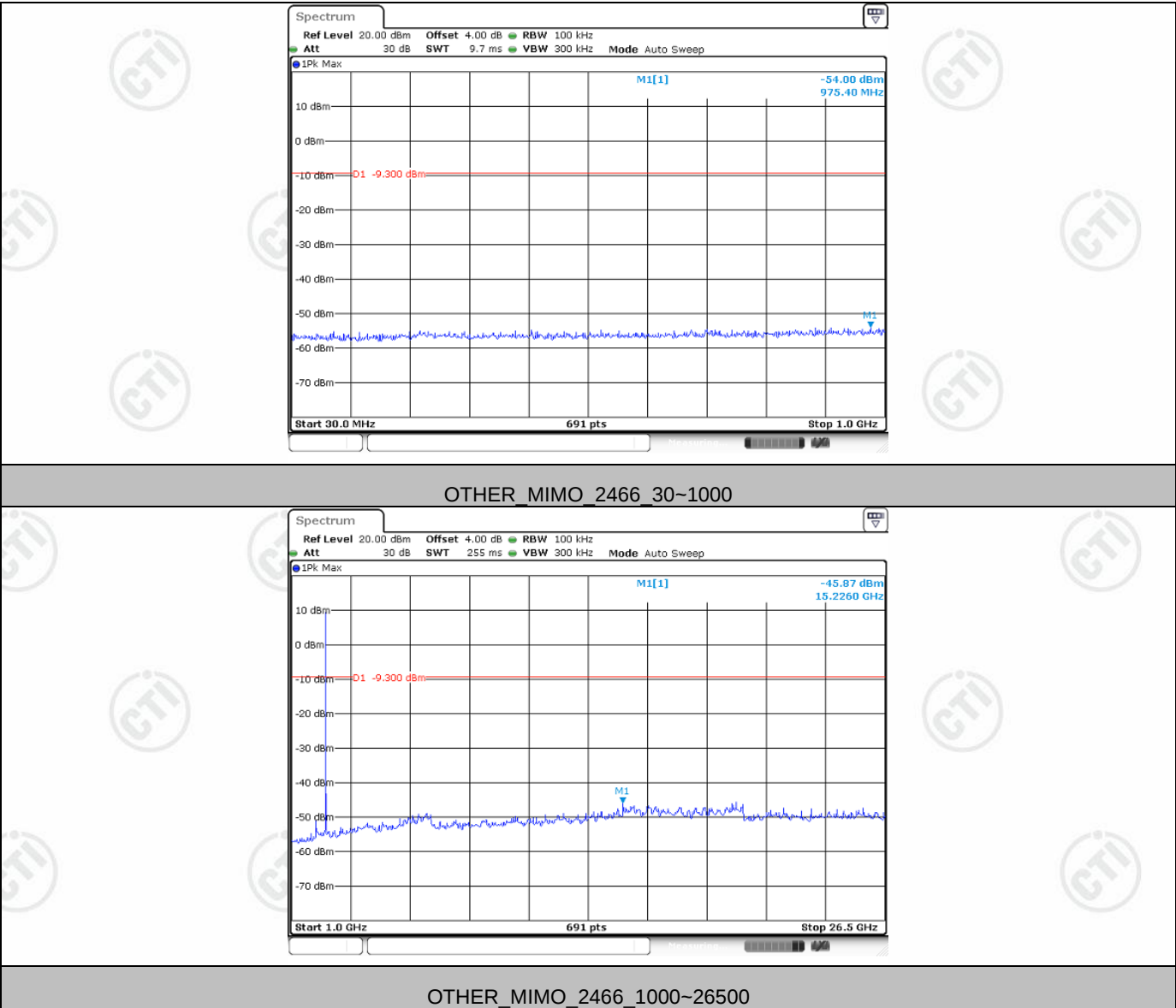
OTHER_MIMO_2406_30~1000



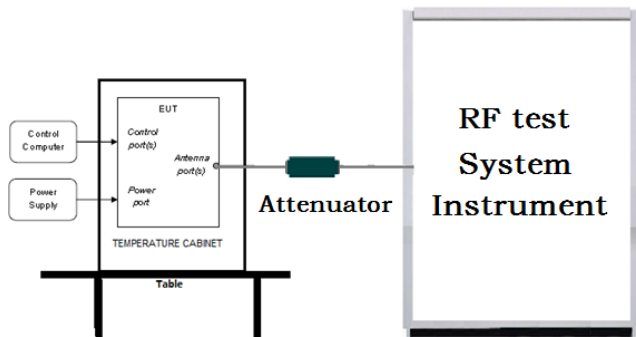
OTHER_MIMO_2406_1000~26500







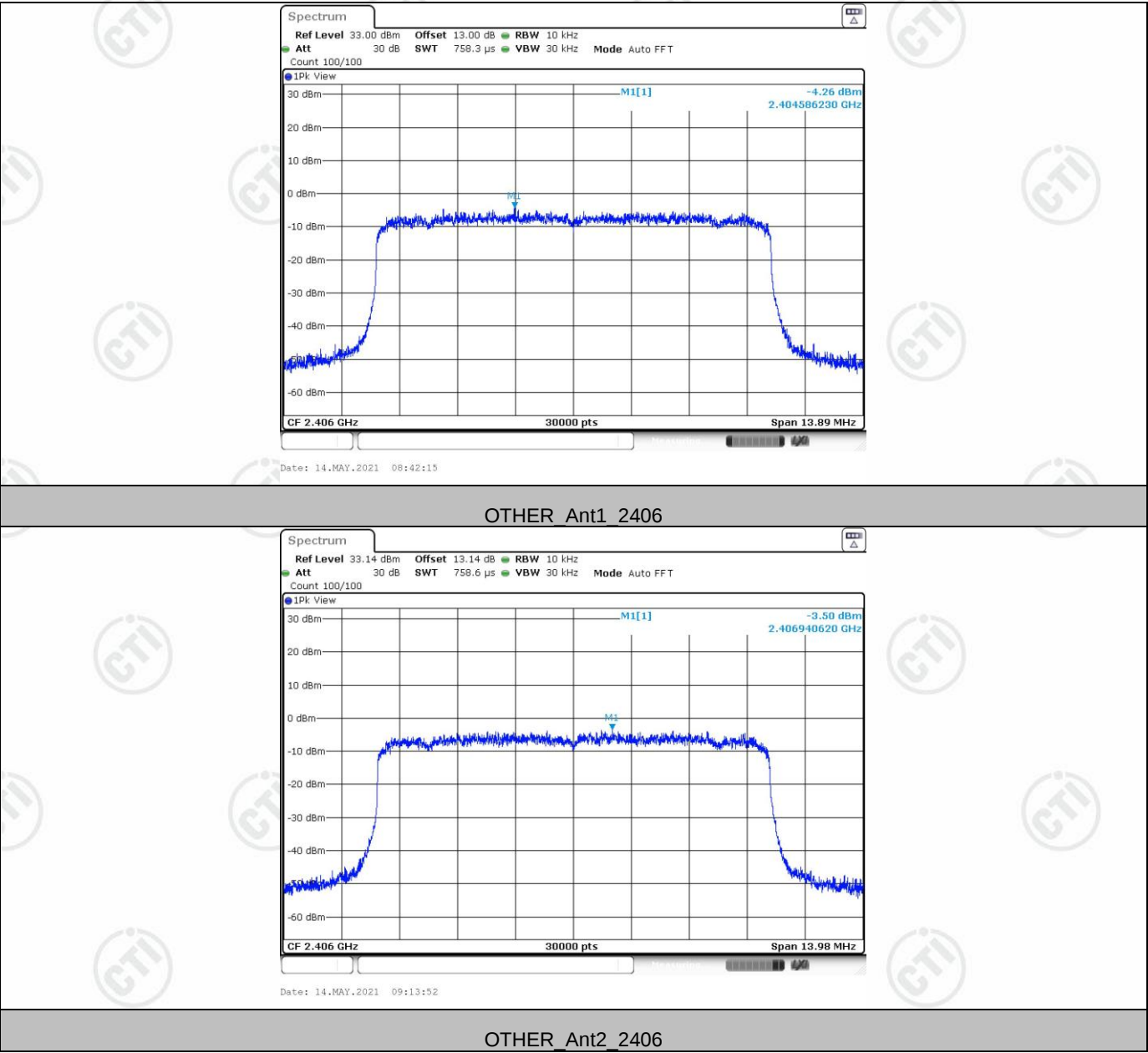
Appendix E): Maximum Power Spectral Density

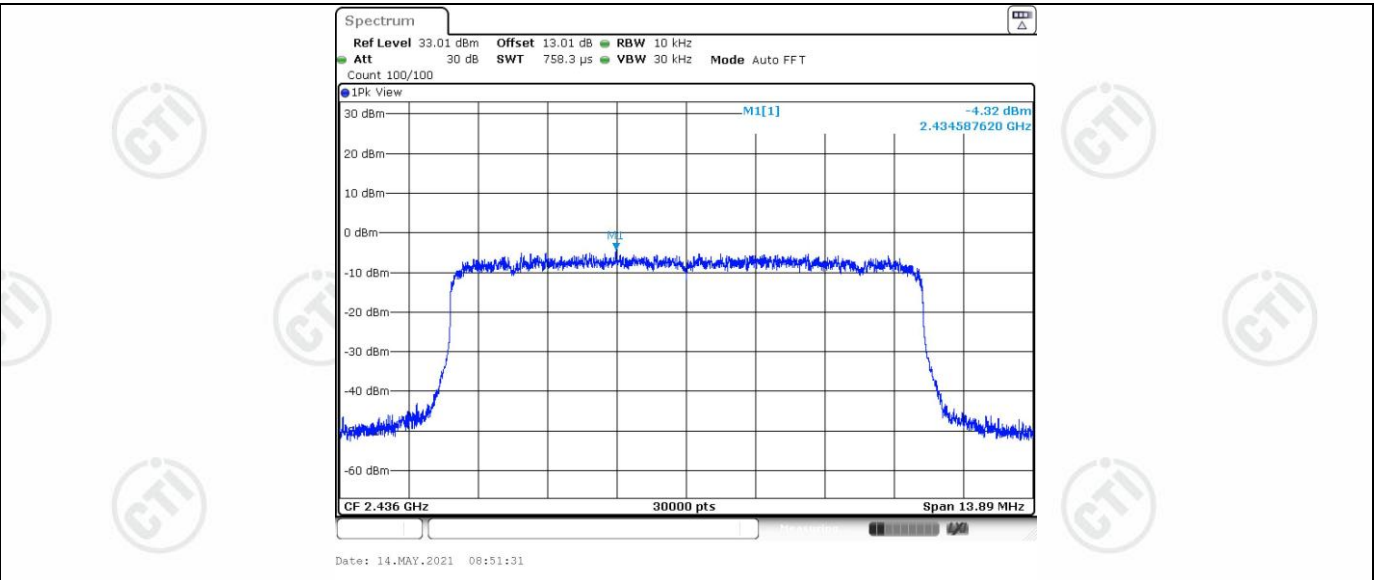
Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10 2013
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Test Procedure:	a) Set analyzer center frequency to DTS channel center frequency. b) Set the span to 1.5 times the DTS bandwidth. c) Set the RBW to $3 \text{ kHz} < \text{RBW} < 100 \text{ kHz}$. d) Set the VBW $> [3 \times \text{RBW}]$. e) Detector = peak. f) Sweep time = auto couple. g) Trace mode = max hold. h) Allow trace to fully stabilize. i) Use the peak marker function to determine the maximum amplitude level within the RBW. j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.
Limit:	$\leq 8.00 \text{ dBm}/3 \text{ kHz}$
Test Mode:	Refer to clause 2.2
Test Results:	Pass

Result Table:

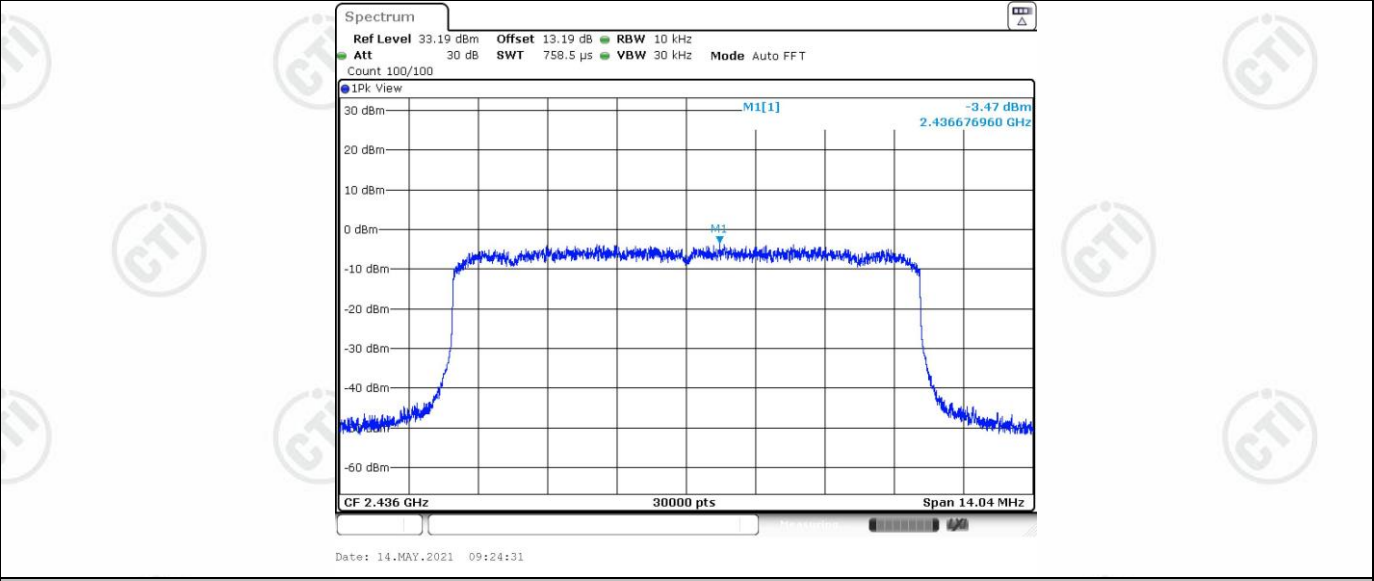
Test Mode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
OTHER	Ant1	2406	-4.26	≤ 8	PASS
	Ant2	2406	-3.5	≤ 8	PASS
	Ant1	2436	-4.32	≤ 8	PASS
	Ant2	2436	-3.47	≤ 8	PASS
	Ant1	2466	-5.04	≤ 8	PASS
	Ant2	2466	-4.03	≤ 8	PASS
	Total	2406	-0.85	≤ 8	PASS
		2436	-0.86	≤ 8	PASS
		2466	-1.50	≤ 8	PASS

Test Graph:

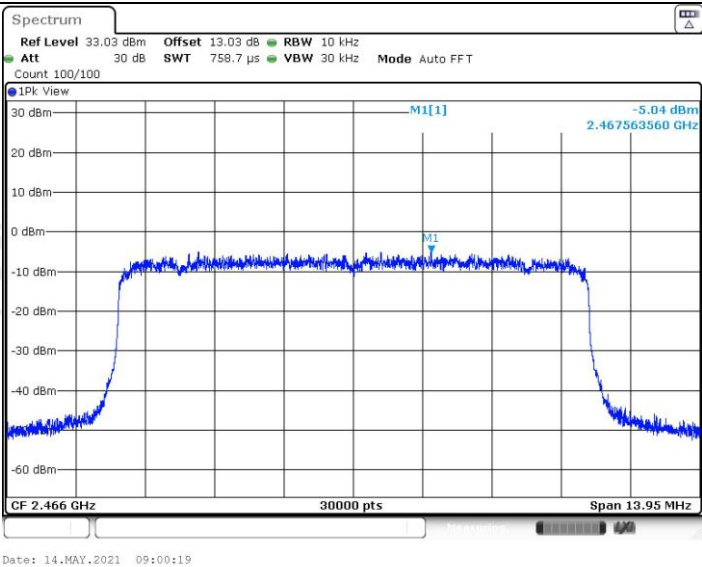




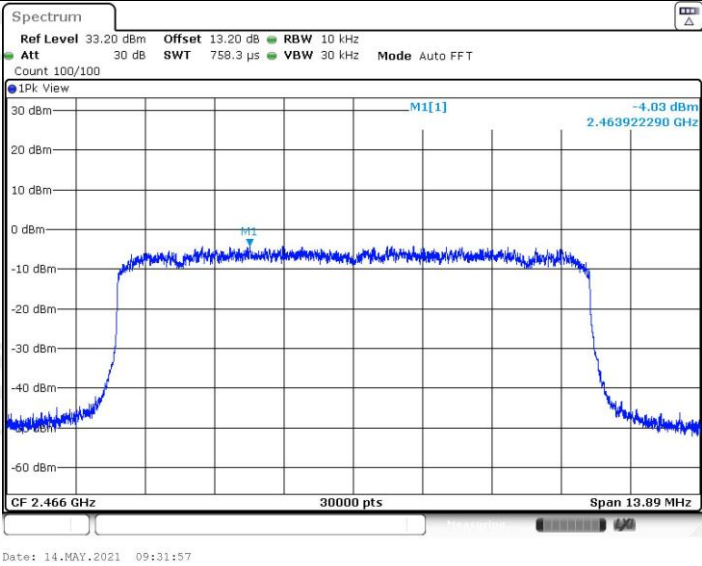
OTHER Ant1 2436



OTHER Ant2 2436

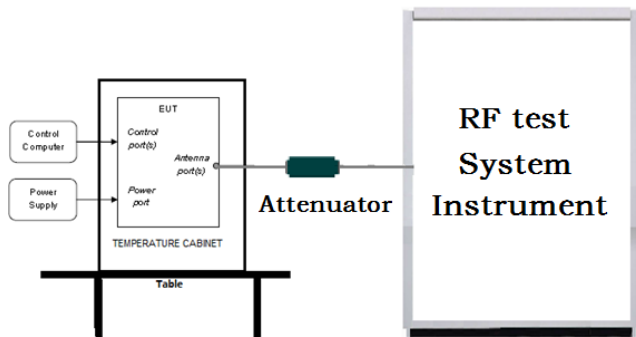


OTHER_Ant1_2466



OTHER_Ant2_2466

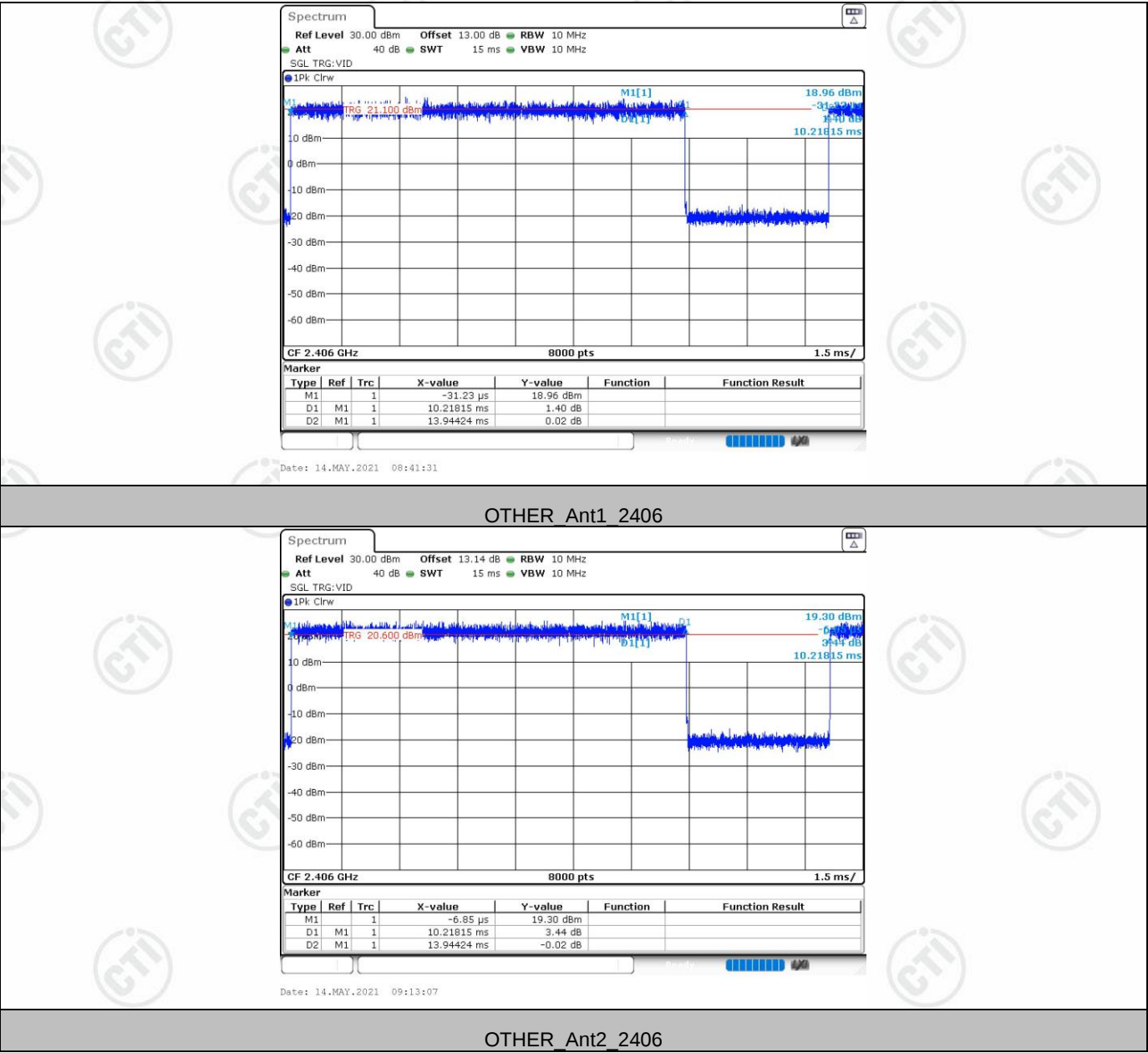
Appendix F): Duty cycle

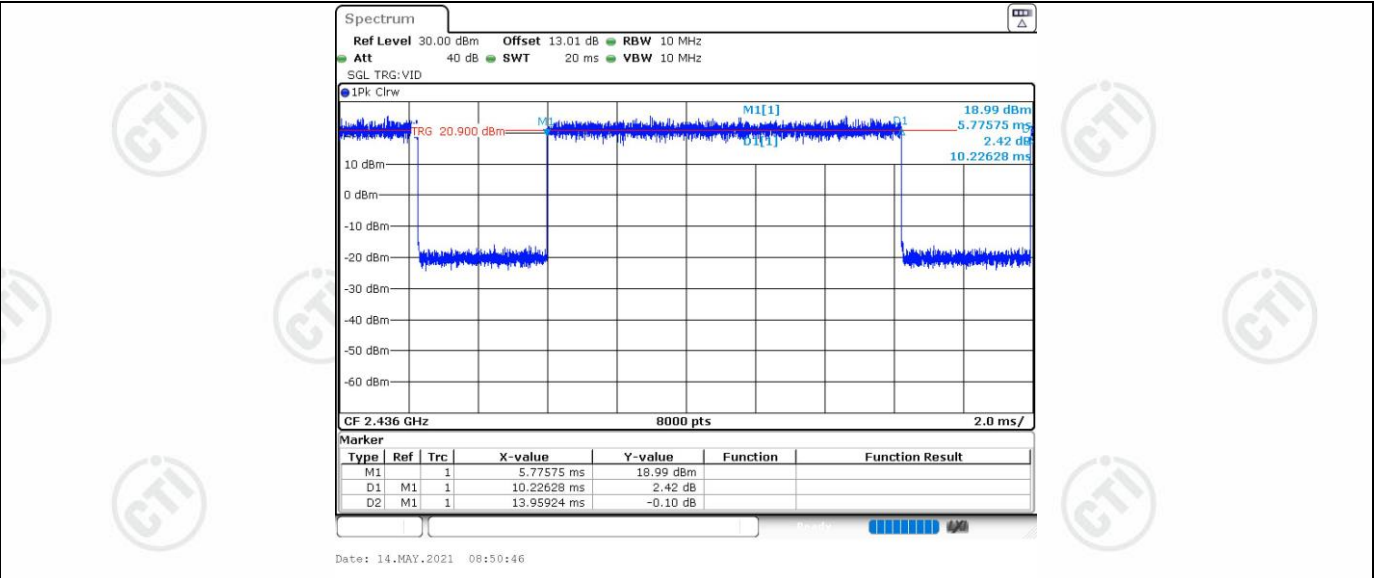
Test Requirement:	47 CFR Part15C Section 15.35 (c)
Test Method:	ANSI C63.10 2013
Test Setup:	 Remark: Offset=Cable loss+ attenuation factor.
Test Procedure:	a) Set RBW $\geq$ OBW if possible; otherwise, set RBW to the largest available value. b) Set VBW $\geq$ RBW. c) detector = peak or average. d) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the ON and OFF times of the transmitted signal:
Limit:	---
Test Mode:	Refer to clause 2.2
Test Results:	Pass

Test Result:

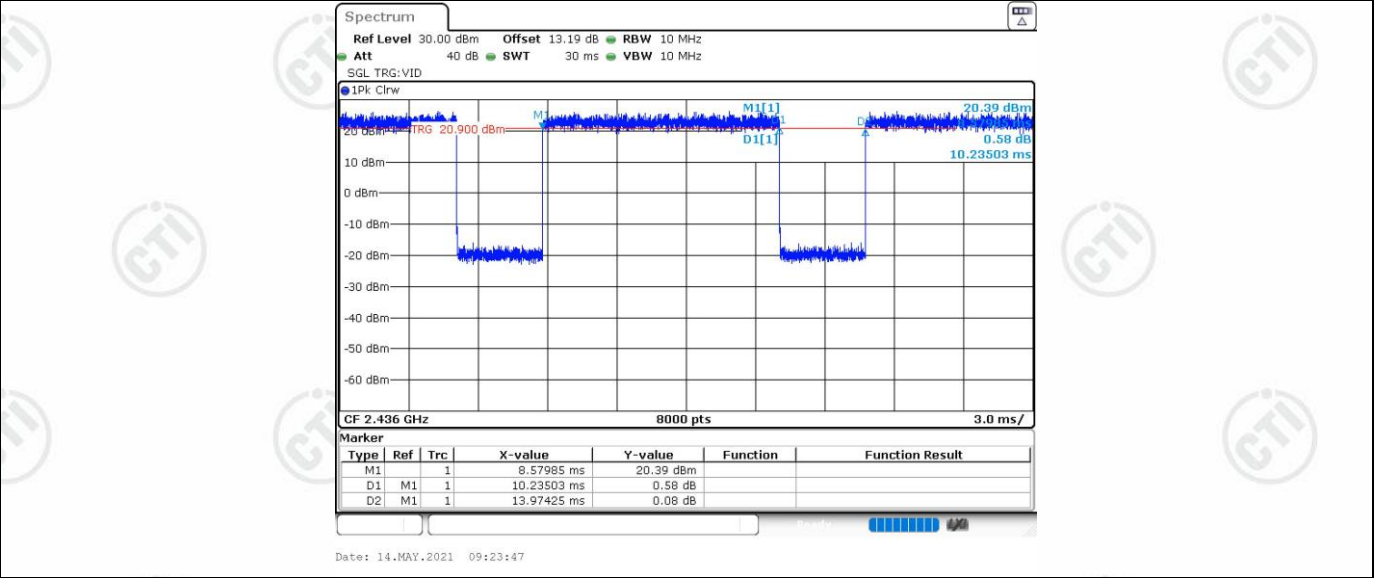
Test Mode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
OTHER	Ant1	2406	10.22	13.94	0.7331	73.31	1.35	---	PASS
	Ant2	2406	10.22	13.94	0.7331	73.31	1.35	---	PASS
	Ant1	2436	10.23	13.96	0.7328	73.28	1.35	---	PASS
	Ant2	2436	10.24	13.97	0.7330	73.30	1.35	---	PASS
	Ant1	2466	10.23	13.96	0.7328	73.28	1.35	---	PASS
	Ant2	2466	10.23	13.96	0.7328	73.28	1.35	---	PASS

Result Table:

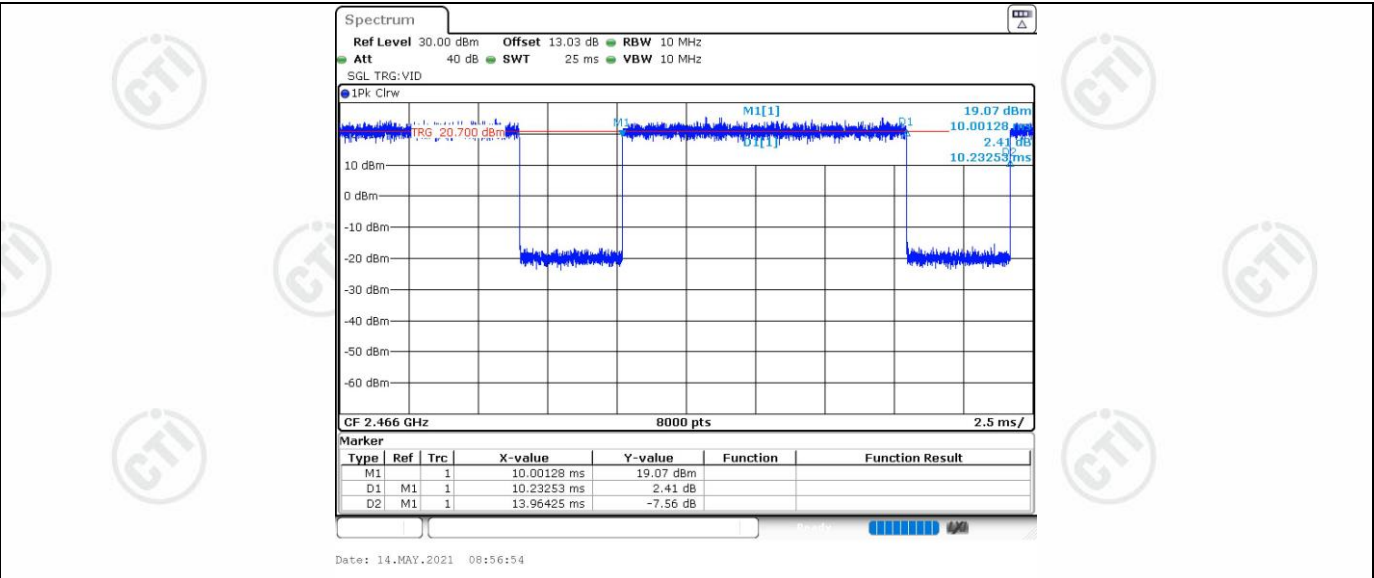




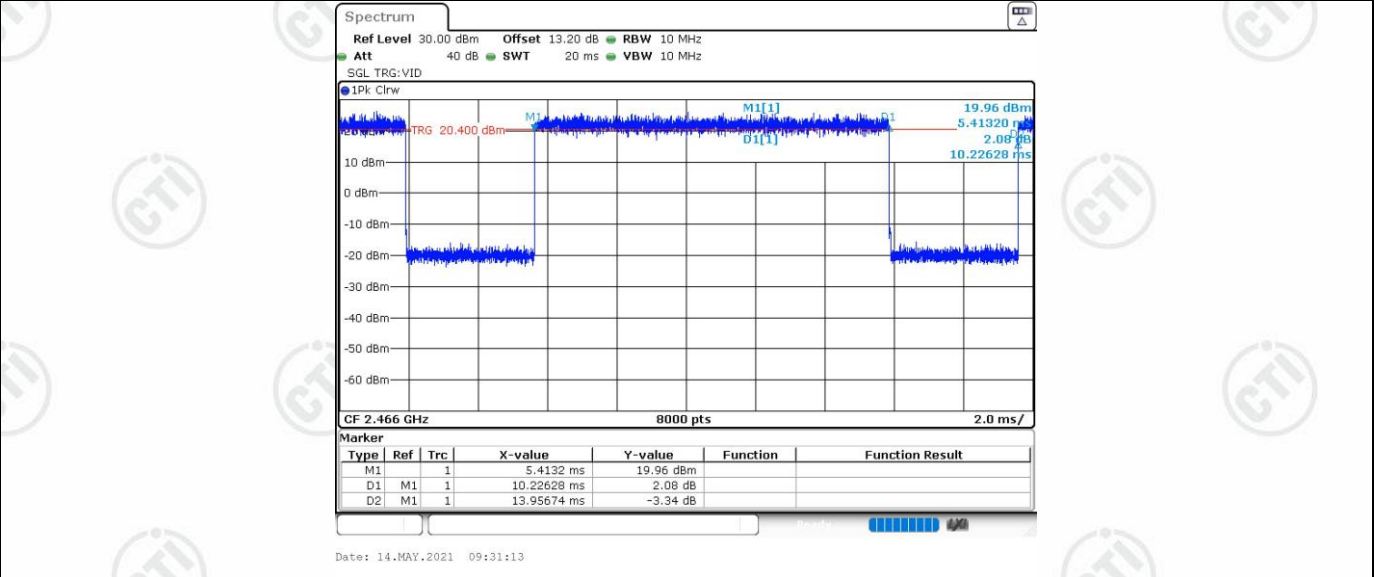
OTHER Ant1 2436



OTHER Ant2 2436



OTHER Ant1 2466



OTHER Ant2 2466

Appendix G): Antenna Requirement

15.203 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

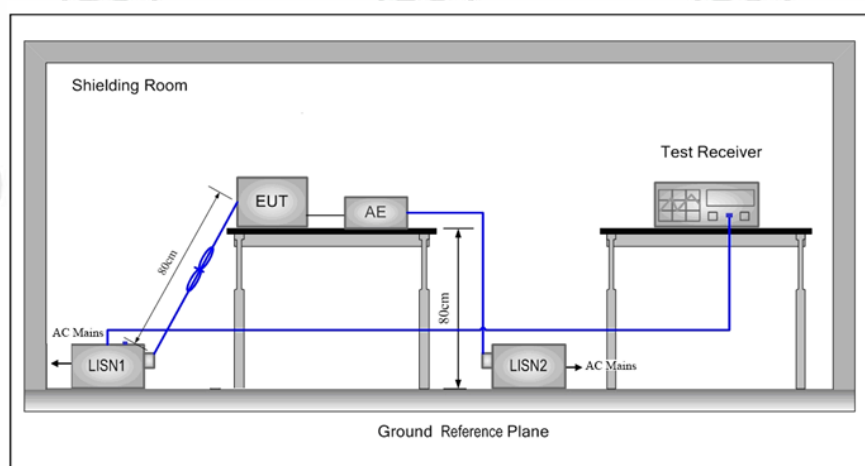
EUT Antenna:



The antenna is integrated on the main PCB and no consideration of replacement.

Test Requirement:	47 CFR Part 15C Section 15.207		
Test Method:	ANSI C63.10: 2013		
Test Frequency Range:	150kHz to 30MHz		
Receiver setup:	RBW=9 kHz, VBW=30 kHz, Sweep time=auto		
Limit:	Frequency range (MHz)	Limit (dBuV)	
		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.		

* Decreases with the logarithm of the frequency.



- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

Report No. : EED39N80209403

Test Mode:	/
Test Results:	N/A

Measurement Data
The product is supplied by DC power.

Appendix I): Restricted Bands around Fundamental Frequency (Radiated)

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 2013				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10kHz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

Test Setup:

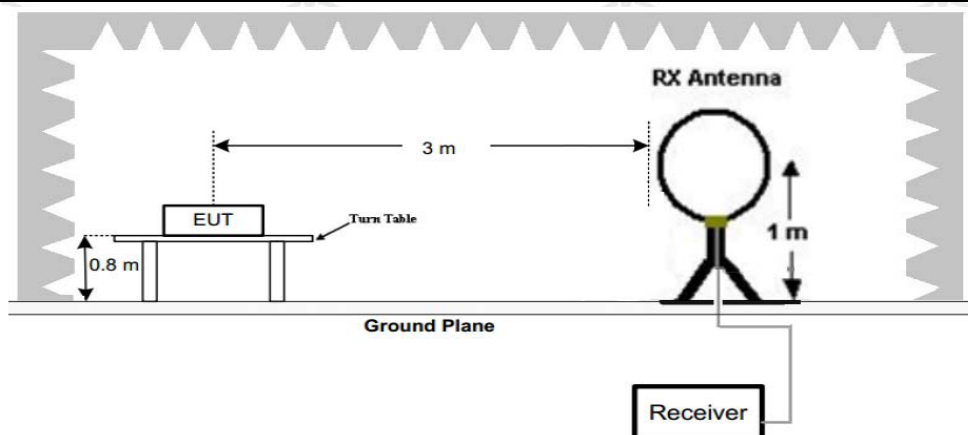


Figure 1. Below 30MHz

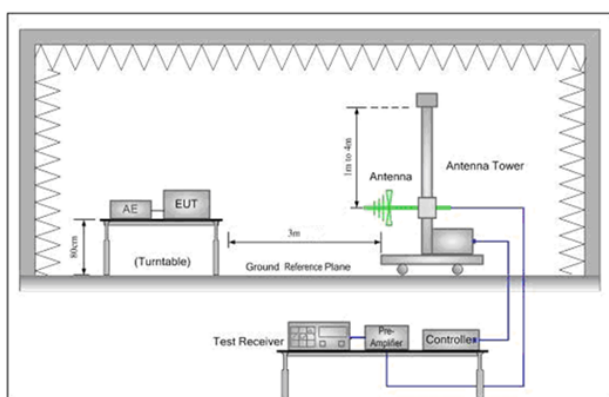


Figure 2. 30MHz to 1GHz

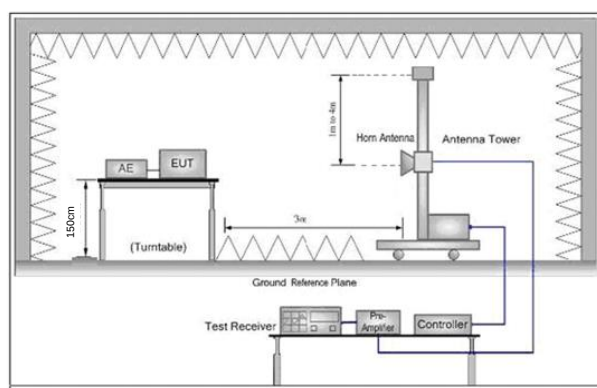


Figure 3. Above 1 GHz

Test Procedure:

- a. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

Note: For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

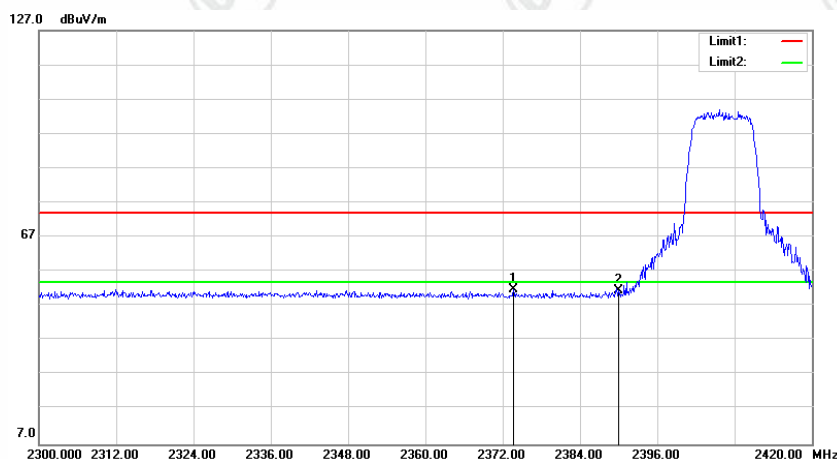
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

	c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. Test the EUT in the lowest channel (2402MHz),the middle channel (2440MHz),the Highest channel (2480MHz) h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. i. Repeat above procedures until all frequencies measured was complete.
Test Mode:	Refer to clause 2.2
Test Results:	Pass

Test plot as follows:

Mode:	Transmitting	Channel:	1
Remark:	Horizontal		

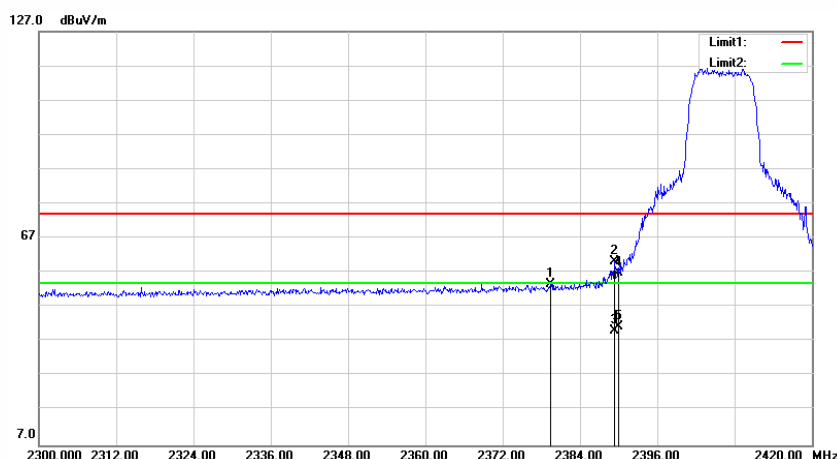
Test Graph



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2373.680	49.03	2.67	51.70	74.00	-22.30	100	47	peak
2	2390.000	48.93	2.71	51.64	74.00	-22.36	128	0	peak

Mode:	Transmitting	Channel:	1
Remark:	Vertical		

Test Graph

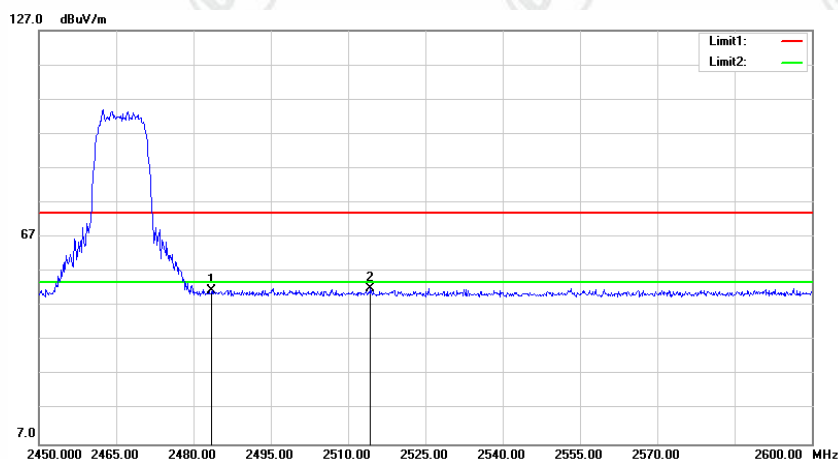


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2379.440	51.00	2.68	53.68	74.00	-20.32	197	0	peak
2	2389.400	57.68	2.71	60.39	74.00	-13.61	100	172	peak
3	2389.400	37.55	2.71	40.26	54.00	-13.74	100	172	AVG
4	2390.000	54.20	2.71	56.91	74.00	-17.09	200	11	peak
5	2390.000	38.75	2.71	41.46	54.00	-12.54	200	11	AVG

Test plot as follows:

Mode:	Transmitting	Channel:	7
Remark:	Horizontal		

Test Graph



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2483.500	48.54	2.92	51.46	74.00	-22.54	135	0	peak
2	2514.350	49.08	2.98	52.06	74.00	-21.94	200	328	peak

Mode:	Transmitting	Channel:	7
Remark:	Vertical		

Test Graph



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Degree (deg.)	Remark
1	2483.500	51.05	2.92	53.97	74.00	-20.03	200	339	peak
2	2489.150	51.14	2.93	54.07	74.00	-19.93	151	360	peak
3	2489.150	37.50	2.93	40.43	54.00	-13.57	151	360	AVG

1)As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation. So, only the peak values are measured:

2) The field strength is calculated by adding the correct Factor. The basic equation with a sample calculation is as follows:

Final Test Level = Reading +Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

Appendix J): Radiated Spurious Emissions

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205				
Test Method:	ANSI C63.10 2013				
Test Site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver Setup:	Frequency	Detector	RBW	VBW	Remark
	0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
	0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
	0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
	0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
	0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
	30MHz-1GHz	Quasi-peak	100 kHz	300kHz	Quasi-peak
	Above 1GHz	Peak	1MHz	3MHz	Peak
		Peak	1MHz	10kHz	Average
Limit:	Frequency	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz-88MHz	100	40.0	Quasi-peak	3
	88MHz-216MHz	150	43.5	Quasi-peak	3
	216MHz-960MHz	200	46.0	Quasi-peak	3
	960MHz-1GHz	500	54.0	Quasi-peak	3
	Above 1GHz	500	54.0	Average	3
	Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.				

Test Setup:

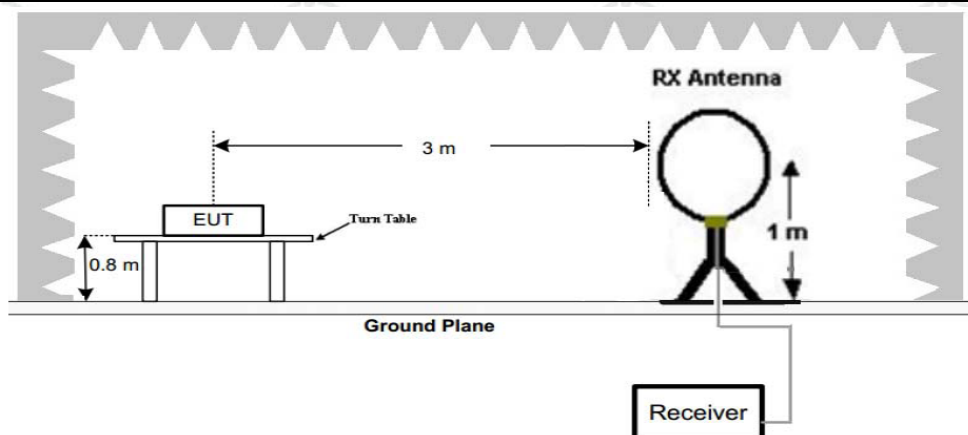


Figure 1. Below 30MHz

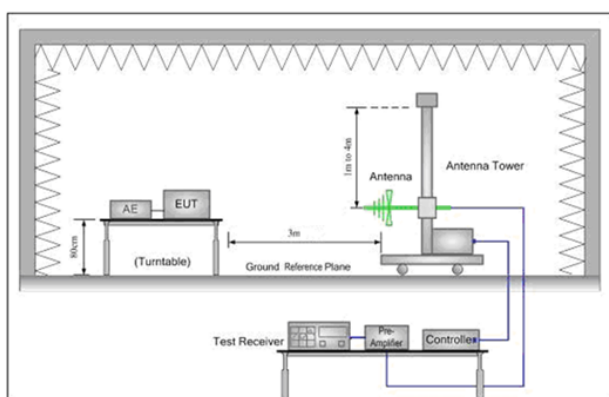


Figure 2. 30MHz to 1GHz

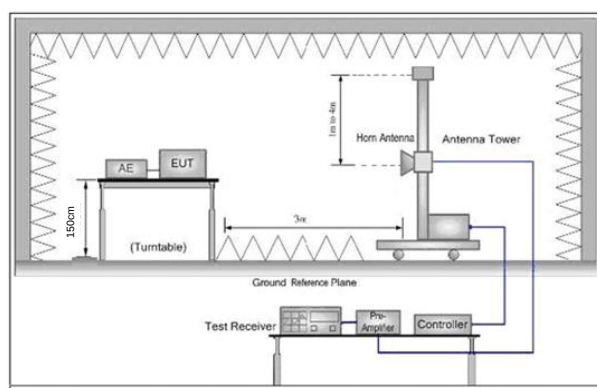


Figure 3. Above 1 GHz

Test Procedure:

- j. 1) Below 1G: The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2) Above 1G: The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
Note: For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- k. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

	l. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. m. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. n. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. o. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. p. Test the EUT in the lowest channel (2402MHz),the middle channel (2440MHz),the Highest channel (2480MHz) q. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. r. Repeat above procedures until all frequencies measured was complete.
Test Mode:	Refer to clause 2.2
Test Results:	Pass

Report No. : EED39N80209403

Radiated Spurious Emissions test Data:

Radiated Emission below 1GHz:

Mode:	Transmitting	Channel:	1
Remark:			

Frequency (MHz)	Ant. Pol. (H/V)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
76.5600	V	51.05	-27.96	23.09	40.00	-16.91	QP
240.4900	V	47.52	-21.42	26.10	46.00	-19.90	QP
383.0800	V	43.18	-18.39	24.79	46.00	-21.21	QP
800.1800	V	44.17	-11.66	32.51	46.00	-13.49	QP
913.6700	V	47.02	-9.82	37.20	46.00	-8.80	QP
998.0600	V	43.25	-9.16	34.09	54.00	-19.91	QP
76.9460	H	61.94	-28.06	33.88	40.00	-6.12	QP
113.6600	H	53.44	-22.82	30.62	43.50	-12.88	QP
113.6600	H	56.71	-22.82	33.89	43.50	-9.61	QP
144.7840	H	57.30	-24.34	32.96	43.50	-10.54	QP
242.1700	H	56.04	-21.42	34.62	46.00	-11.38	QP
717.9180	H	43.61	-12.72	30.89	46.00	-15.11	QP
799.9920	H	49.92	-11.66	38.26	46.00	-7.74	QP

Notes:

1) Through Pre-scan then find the CH1 is the worst case mode and only the worst data was recorded.

Transmitter Emission above 1GHz:

Mode:	Transmitting	Channel:	1
Remark:			

Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4825.000	36.47	9.20	45.67	74.00	-28.33	100	169	peak
2	8480.000	31.84	13.63	45.47	74.00	-28.53	200	34	peak
3	11540.000	32.44	17.22	49.66	74.00	-24.34	200	226	peak

Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4978.000	38.71	9.55	48.26	74.00	-25.74	200	143	peak
2	8225.000	30.79	13.27	44.06	74.00	-29.94	187	0	peak

Mode:	Transmitting	Channel:	4
Remark:			

Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4995.000	34.43	9.59	44.02	74.00	-29.98	100	89	peak
2	8854.000	30.94	13.93	44.87	74.00	-29.13	100	332	peak

Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4978.000	36.67	9.55	46.22	74.00	-27.78	150	0	peak
2	8480.000	31.04	13.63	44.67	74.00	-29.33	126	0	peak

Mode:	Transmitting	Channel:	7
Remark:			

Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4825.000	37.50	9.20	46.70	74.00	-27.30	100	165	peak
2	8395.000	31.34	13.51	44.85	74.00	-29.15	200	267	peak

Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Height	Degree	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	(cm)	(deg.)	
1	4995.000	40.27	9.59	49.86	74.00	-24.14	200	211	peak
2	8480.000	30.77	13.63	44.40	74.00	-29.60	100	63	peak

Note:

1)As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak values are measured:

2) The field strength is calculated by adding the correct Factor. The basic equation with a sample calculation is as follows:

Final Test Level = Reading +Correct Factor

Correct Factor = Preamplifier Factor– Antenna Factor–Cable Factor

3) Scan from 9kHz to 25GHz, the disturbance above 18GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Refer to Report No. EED39N80209401 for test setup photos.

APPENDIX 2 PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

Refer to Report No. EED39N80209401 for EUT external and internal photos.

The testing data and results in this report are just for scientific research, education, internal quality control and product development etc.

*** End of Report ***

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