Shenzhen Huaxia Testing Technology Co., Ltd.

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Report Template Version: V05
Report Template Revision Date: 2021-11-03

TEST REPORT

Report No.:	CQASZ20240801828E-01
Applicant:	Aeroo Innovations Pty Ltd
Address of Applicant:	10/6a Prosperity Pde, Warriewood, NSW, 2102, Australia
Equipment Under Test (EUT):	
Product:	HT018G
Model No.:	HT018G
Test Model No.:	HT018G
Brand Name:	Aeroo
FCC ID:	2BKDI-HT018G
Standards:	47 CFR Part 15, Subpart C
	KDB558074 D01 15.247 Meas Guidance v05r02
	ANSI C63.10:2013
Date of Receipt:	2024-08-26
Date of Test:	2024-08-26 to 2024-10-23
Date of Issue:	2024-10-28
Test Result :	**PASS***

***In the configuration tested, the EUT complied with the standards specified above**

Tested By: lewis zhou
(Lewis Zhou)

Reviewed By: Timo Lei
(Timo Lei)

Approved By: Alex
(Alex Wang)

1 Version

Revision History Of Report

Report No.	Version	Description	Issue Date
CQASZ20240801828E-01	Rev.01	Initial report	2024-10-28

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15.203	N/A	PASS
AC Power Line Conducted Emission	47 CFR Part 15.207	ANSI C63.10-2013	PASS
Conducted Peak & Average Output Power	47 CFR Part 15.247	ANSI C63.10-2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15.247	ANSI C63.10-2013	PASS
Power Spectral Density	47 CFR Part 15.247	ANSI C63.10-2013	PASS
Band-edge for RF Conducted Emissions	47 CFR Part 15.247	ANSI C63.10-2013	PASS
RF Conducted Spurious Emissions	47 CFR Part 15.247	ANSI C63.10-2013	PASS
Radiated Spurious Emissions	47 CFR Part 15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15.205/15.209	ANSI C63.10-2013	PASS

Remark:

The tested sample(s) and the sample information are provided by the client.

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radiated Frequency.

CH: In this whole report CH means channel.

Volt: In this whole report Volt means Voltage.

Temp: In this whole report Temp means Temperature.

Humid: In this whole report Humid means humidity.

Press: In this whole report Press means Pressure.

N/A: In this whole report not application

3 Contents

Page

4 General Information

4.1 Client Information

Applicant:	Aeroo Innovations Pty Ltd
Address of Applicant:	10/6a Prosperity Pde, Warriewood, NSW, 2102, Australia
Manufacturer:	SHENZHEN HUBSAN TECHNOLOGY CO.,LTD
Address of Manufacturer:	2101-02C, Xinghe WORLDF Building, No.1 Yabao Road, Nankeng Community, Bantian Street, Longgang District, Shenzhen , China
Factory:	Dongguan Tengsheng Industrial Co., LTD
Address of Factory:	16th Floor, No. 2 Tiansha Road, Tangxia Town, Dongguan, China. Post code: 523718

4.2 General Description of EUT

Product Name:	HT018G
Model No.:	HT018G
Test Model No.:	HT018G
Trade Mark:	Aeroo
Software Version:	V1.0
Hardware Version:	V1.0
Power Supply:	Li-ion battery DC 3.6V 5000mAh, Charge by DC 5V for adapter
EUT Supports Radios application:	2.4GHz: 2406MHz~2470MHz
Simultaneous Transmission	☐ Simultaneous TX is supported and evaluated in this report. ☒ Simultaneous TX is not supported.

4.3 Product Specification subjective to this standard

Operation Frequency:	2406MHz~2470MHz
Channel Numbers:	9 Channels
Channel Separation:	5MHz
Type of Modulation:	OFDM
Product Type:	☐ Mobile ☒ Portable
Test Software of EUT:	Artosyn8020PCTool-v4.4.8
Antenna Type:	External antenna
Antenna Gain:	2.09dBi

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2406MHz	4	2430MHz	7	2454MHz		
2	2414MHz	5	2438MHz	8	2462MHz		
3	2422MHz	6	2446MHz	9	2470MHz		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

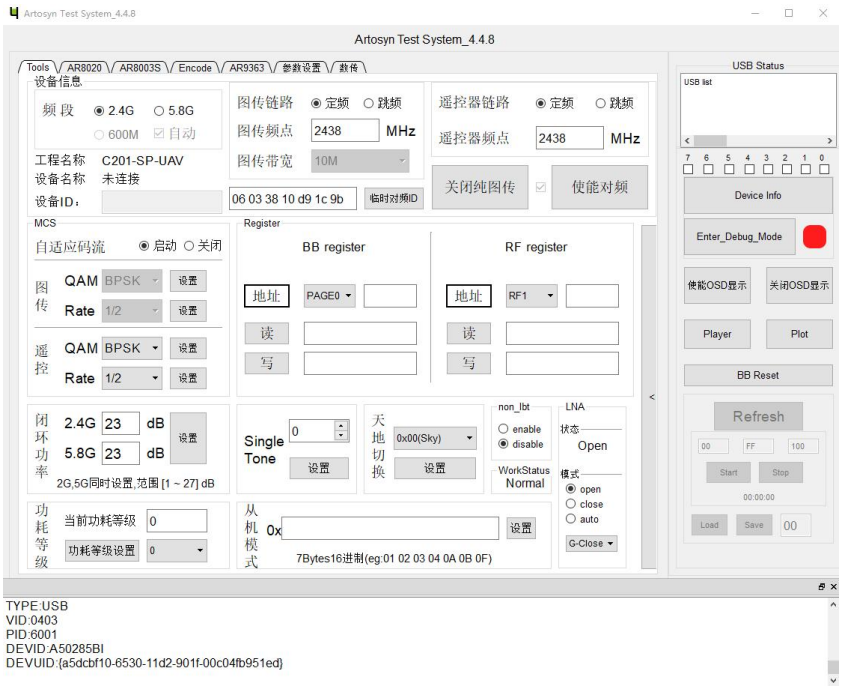
Channel	Frequency
The Lowest channel	2406MHz
The Middle channel	2438MHz
The Highest channel	2470MHz

Note:

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.4 Test Environment and Mode

Operating Environment:	
Radiated Emissions:	
Temperature:	25.3 °C
Humidity:	55 % RH
Atmospheric Pressure:	1009 mbar
Conducted Emissions:	
Temperature:	25.6 °C
Humidity:	60 % RH
Atmospheric Pressure:	1009 mbar
Radio conducted item test (RF Conducted test room):	
Temperature:	25.5 °C
Humidity:	52 % RH
Atmospheric Pressure:	1009 mbar
Test mode:	
Transmitting mode:	EUT is set in RF test mode in all supported modulation types, bandwidth and data rate, etc.
Run Software:	



4.5 Description of Support Units

The EUT has been tested with associated equipment below.

1) Support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
/	/	/	/	/

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
/	/	/	/	/

4.6 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.

1F., Block A of Tongsheng Technology Building, Huahui Road, Dalang Street, Longhua New District, Shenzhen, Guangdong, China

4.7 Test Facility

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

- **A2LA (Certificate No. 4742.01)**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 4742.01.

- **FCC Registration No.: 522263**

Shenzhen Huaxia Testing Technology Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No.:522263

4.8 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate.

The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities.

The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the **Shenzhen Huaxia Testing Technology Co., Ltd.** quality system acc. to DIN EN ISO/IEC 17025.

Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CQA laboratory is reported:

No.	Item	Uncertainty	Notes
1	Radiated Emission (Below 1GHz)	5.12dB	(1)
2	Radiated Emission (Above 1GHz)	4.60dB	(1)
3	Conducted Disturbance (0.15~30MHz)	3.34dB	(1)
4	Radio Frequency	3×10^{-8}	(1)
5	Duty cycle	0.6 %.	(1)
6	Occupied Bandwidth	1.1%	(1)
7	RF conducted power	0.86dB	(1)
8	RF power density	0.74	(1)
9	Conducted Spurious emissions	0.86dB	(1)
10	Temperature test	0.8℃	(1)
11	Humidity test	2.0%	(1)
12	Supply voltages	0.5 %.	(1)
13	Frequency Error	5.5 Hz	(1)

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.9 Deviation from Standards

None.

4.10 Abnormalities from Standard Conditions

None.

4.11 Other Information Requested by the Customer

None.

4.12 Equipment List

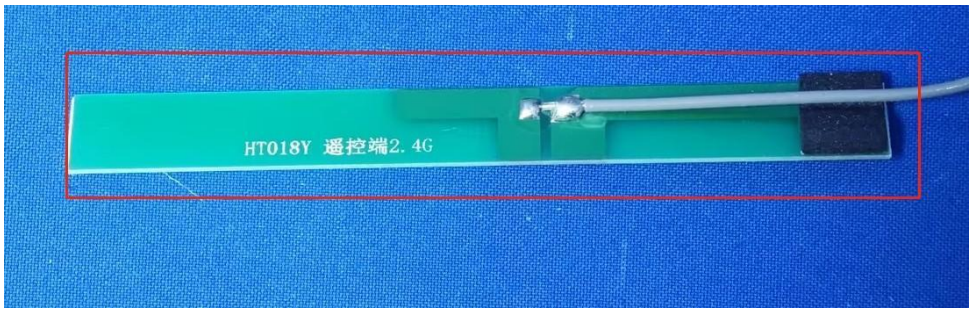
Test Equipment	Manufacturer	Model No.	Instrument No.	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESR7	CQA-005	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Spectrum analyzer	R&S	FSU26	CQA-038	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Spectrum analyzer	R&S	FSU40	CQA-075	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Preamplifier	MITEQ	AFS4-00010300-18-10P-4	CQA-035	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Preamplifier	MITEQ	AMF-6D-02001800-29-20P	CQA-036	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Preamplifier	EMCI	EMC184055SE	CQA-089	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Loop antenna	Schwarzbeck	FMZB1516	CQA-060	2021/09/16	2024/09/15
Bilog Antenna	R&S	HL562	CQA-011	2021/09/16	2024/09/15
Horn Antenna	R&S	HF906	CQA-012	2021/09/16	2024/09/15
Horn Antenna	Schwarzbeck	BBHA 9170	CQA-088	2021/09/16	2024/09/15
Coaxial Cable (Above 1GHz)	CQA	N/A	C007	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Coaxial Cable (Below 1GHz)	CQA	N/A	C013	2023/09/08 2024/09/02	2024/09/07 2025/09/01
RF cable(9KHz~40GHz)	CQA	RF-01	CQA-079	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Antenna Connector	CQA	RFC-01	CQA-080	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Power Sensor	KEYSIGHT	U2021XA	CQA-30	2023/09/08 2024/09/02	2024/09/07 2025/09/01
N1918A Power Analysis Manager Power Panel	Agilent	N1918A	CQA-074	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Power meter	R&S	NRVD	CQA-029	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Power divider	MIDWEST	PWD-2533-02-SMA-79	CQA-067	2023/09/08 2024/09/02	2024/09/07 2025/09/01
EMI Test Receiver	R&S	ESR7	CQA-005	2023/09/08 2024/09/02	2024/09/07 2025/09/01
LISN	R&S	ENV216	CQA-003	2023/09/08 2024/09/02	2024/09/07 2025/09/01
Coaxial cable	CQA	N/A	CQA-C009	2023/09/08 2024/09/02	2024/09/07 2025/09/01
DC power	KEYSIGHT	E3631A	CQA-028	2023/09/08 2024/09/02	2024/09/07 2025/09/01

Test software:

	Manufacturer	Software brand
Radiated Emissions test software	Tonscend	JS1120-3
Conducted Emissions test software	Audix	e3
RF Conducted test software	Audix	e3

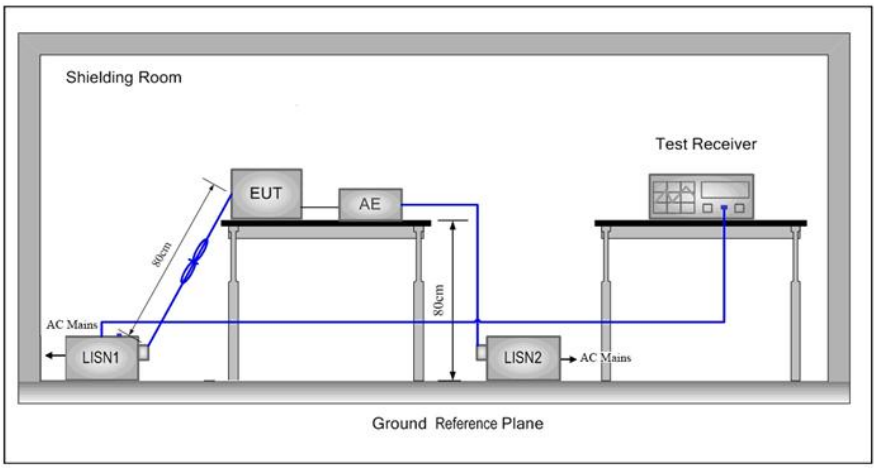
5 Test results and Measurement Data

5.1 Antenna Requirement

Standard requirement:	47 CFR Part 15C Section 15.203 /247(c)
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 External antenna . The connection/connection type between the antenna to the EUT's antenna port is: unique coupling. This is either permanently attachment or a unique coupling that satisfies the requirement.	

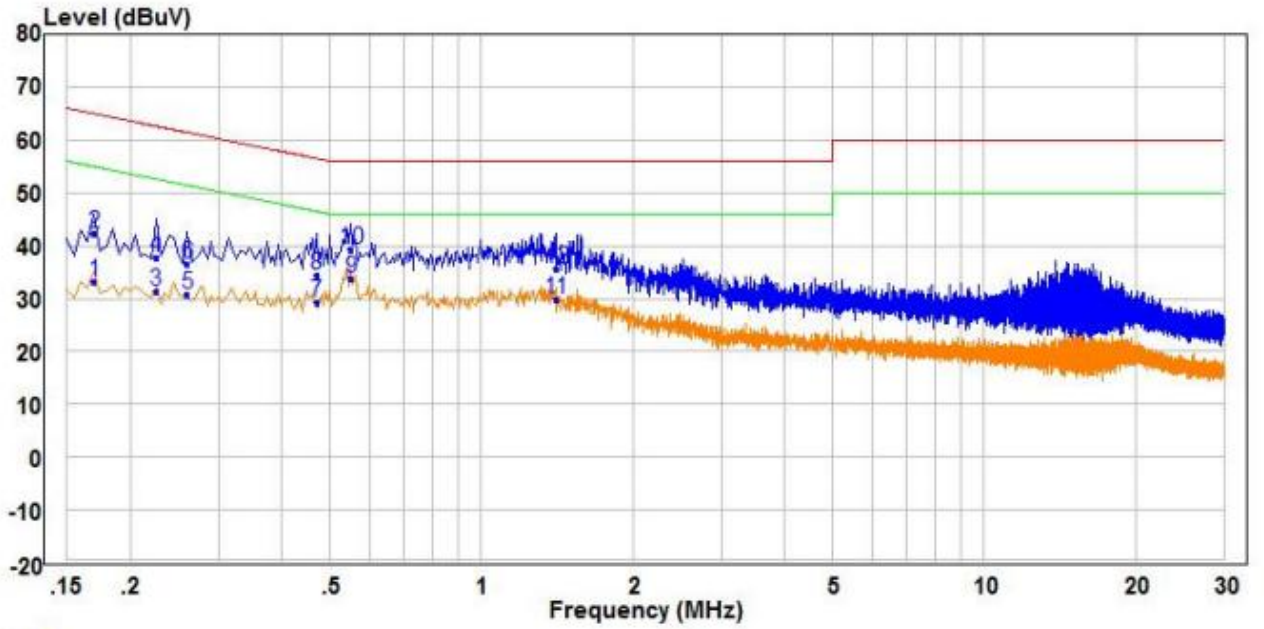
5.2 Conducted Emissions

<table>
<tr><td>Test Requirement:</td><td>47 CFR Part 15C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.10: 2013</td></tr>
<tr><td>Test Frequency Range:</td><td>150kHz to 30MHz</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr>
<tr><th>Quasi-peak</th><th>Average</th></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* Decreases with the logarithm of the frequency.
</td></tr>
<tr><td>Test Procedure:</td><td>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 50Ω/50μH + 5Ω 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.</td></tr>
</table>

Test Setup:	
Test Mode:	Through Pre-scan, find the transmitting mode at the lowest channel is the worst case.
Test Voltage:	AC 120V/60Hz
Test Results:	Pass

Measurement Data

Live line:



		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.170	23.76	9.49	33.25	54.96	-21.71	Average	Line
2		0.170	32.78	9.49	42.27	64.96	-22.69	QP	Line
3		0.225	21.76	9.49	31.25	52.63	-21.38	Average	Line
4		0.225	28.28	9.49	37.77	62.63	-24.86	QP	Line
5		0.260	21.22	9.49	30.71	51.43	-20.72	Average	Line
6		0.260	27.06	9.49	36.55	61.43	-24.88	QP	Line
7		0.470	19.82	9.52	29.34	46.51	-17.17	Average	Line
8		0.470	25.03	9.52	34.55	56.51	-21.96	QP	Line
9	PP	0.550	24.05	9.61	33.66	46.00	-12.34	Average	Line
10	QP	0.550	29.72	9.61	39.33	56.00	-16.67	QP	Line
11		1.405	20.21	9.53	29.74	46.00	-16.26	Average	Line
12		1.405	26.15	9.53	35.68	56.00	-20.32	QP	Line

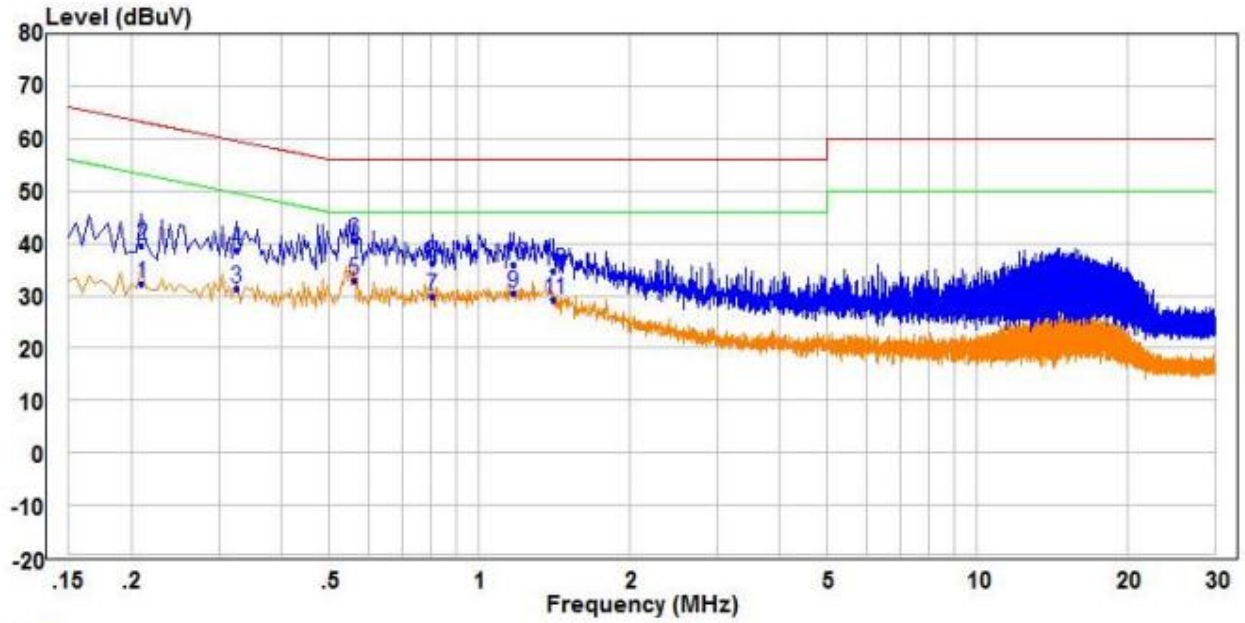
Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

3. If the Peak value under Average limit, the Average value is not recorded in the report.

Neutral line:



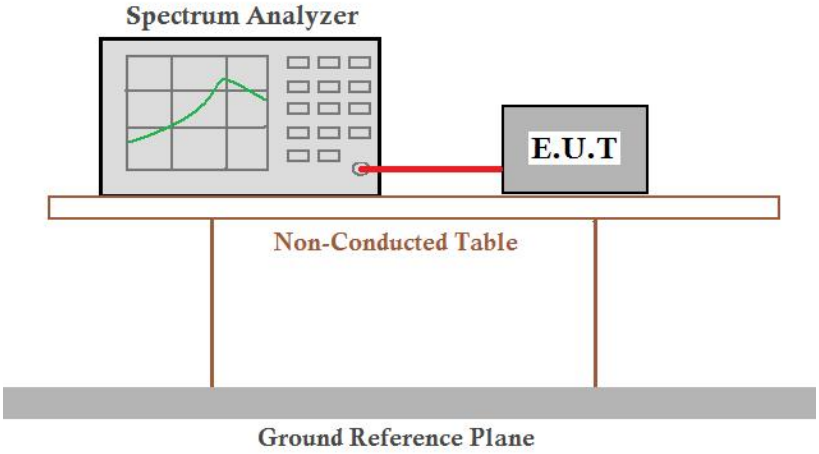
		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.210	22.85	9.59	32.44	53.21	-20.77	Average	Neutral
2		0.210	30.04	9.59	39.63	63.21	-23.58	QP	Neutral
3		0.325	21.80	9.51	31.31	49.58	-18.27	Average	Neutral
4		0.325	29.12	9.51	38.63	59.58	-20.95	QP	Neutral
5	PP	0.560	23.01	9.76	32.77	46.00	-13.23	Average	Neutral
6	QP	0.560	30.82	9.76	40.58	56.00	-15.42	QP	Neutral
7		0.805	20.16	9.83	29.99	46.00	-16.01	Average	Neutral
8		0.805	26.32	9.83	36.15	56.00	-19.85	QP	Neutral
9		1.170	20.79	9.71	30.50	46.00	-15.50	Average	Neutral
10		1.170	26.27	9.71	35.98	56.00	-20.02	QP	Neutral
11		1.410	19.60	9.72	29.32	46.00	-16.68	Average	Neutral
12		1.410	24.94	9.72	34.66	56.00	-21.34	QP	Neutral

Remark:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.
3. If the Peak value under Average limit, the Average value is not recorded in the report.

5.3 Conducted Peak & Average Output Power

Test Requirement:	47 CFR Part 15C Section 15.247 (b)(3)
Test Method:	ANSI C63.10: 2013
Test Setup:	*Setup for Power meter measurement method*  *Setup for Spectrum analyser measurement method* 
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Only the worst case is recorded in the report.
Limit:	30dBm
Test Results:	Pass

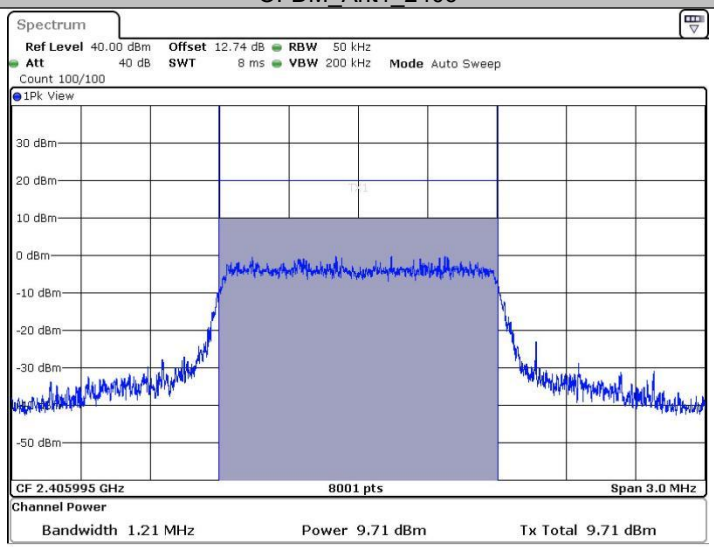
Test Result

Test Mode	Frequency[MHz]	Result [dBm]	Limit [dBm]	Verdict
OFDM	2406	9.71	≤30.00	PASS
	2438	10.43	≤30.00	PASS
	2470	11.86	≤30.00	PASS

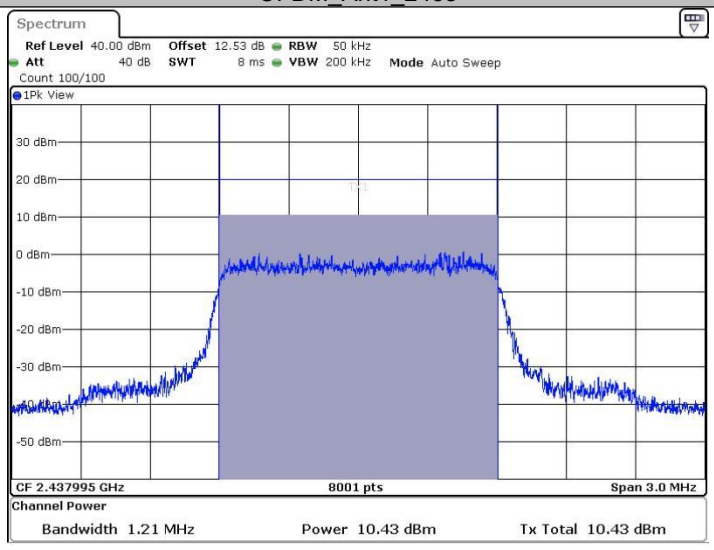
Note:
duty factor has been added to the test data

Test Graphs

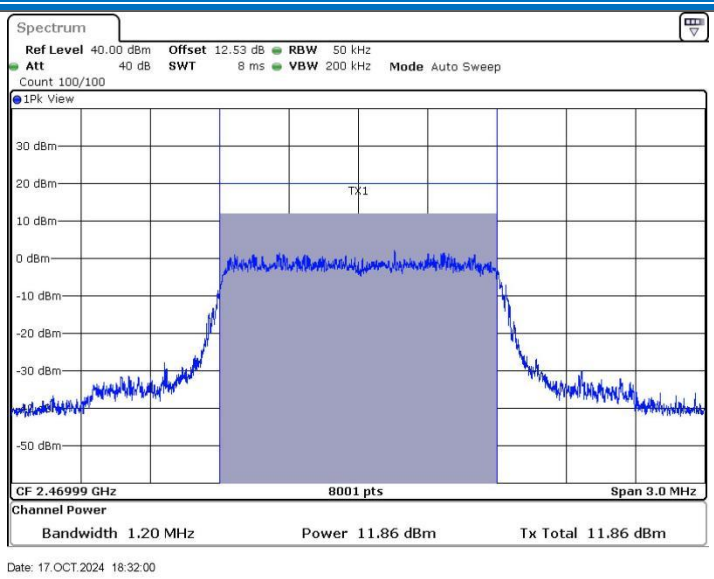
OFDM_Ant1_2406



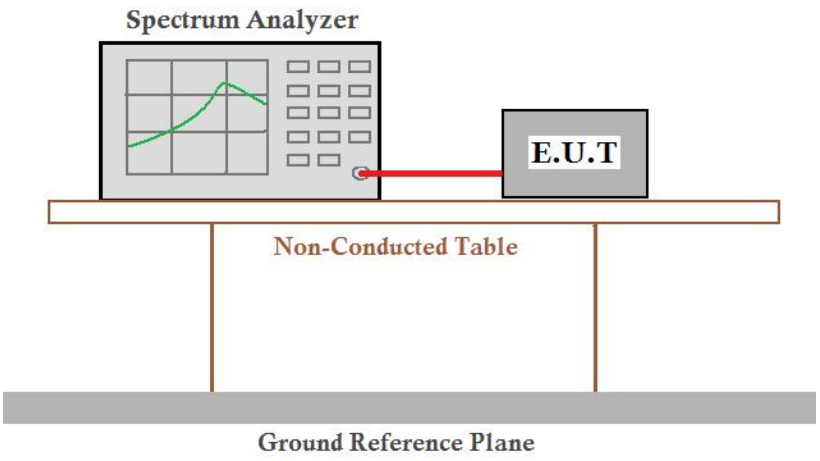
OFDM_Ant1_2438



OFDM_Ant1_2470


Spectrum
Ref Level 40.00 dBm Offset 12.53 dB RBW 50 kHz
Att 40 dB SWT 8 ms VBW 200 kHz Mode Auto Sweep
Count 100/100
1Pk View
30 dBm
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-50 dBm
TX1
CF 2.46999 GHz
8001 pts
Span 3.0 MHz
Channel Power
Bandwidth 1.20 MHz
Power 11.86 dBm
Tx Total 11.86 dBm
Date: 17.OCT.2024 18:32:00

5.4 6dB Occupied Bandwidth

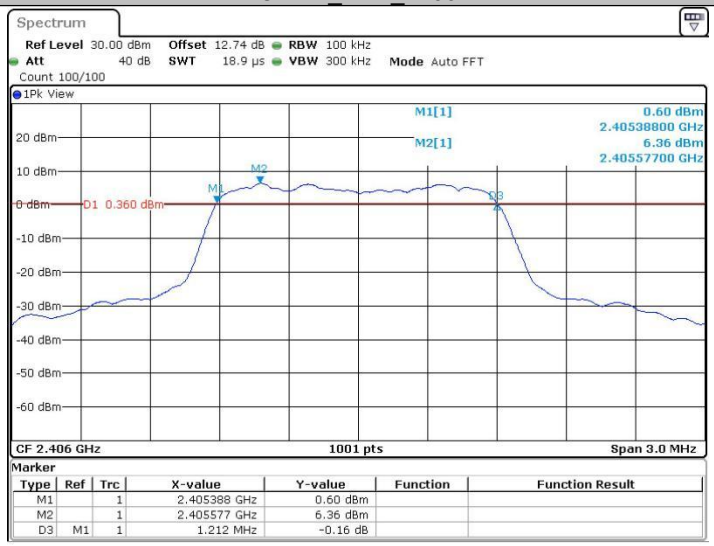
Test Requirement:	47 CFR Part 15C Section 15.247 (a)(2)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Only the worst case is recorded in the report.
Limit:	≥ 500 kHz
Test Results:	Pass

Test Result

TestMode	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
OFDM	2406	1.21	2405.39	2406.60	0.5	PASS
	2438	1.21	2437.39	2438.60	0.5	PASS
	2470	1.20	2469.39	2470.60	0.5	PASS

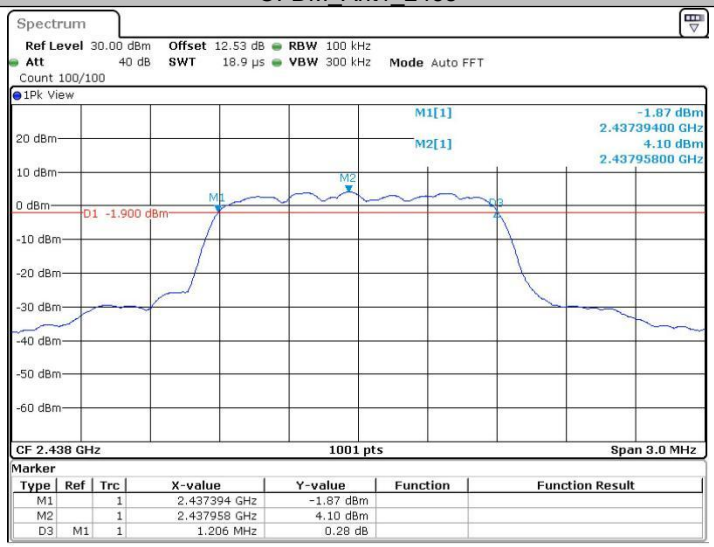
Test Graphs

OFDM_Ant1_2406



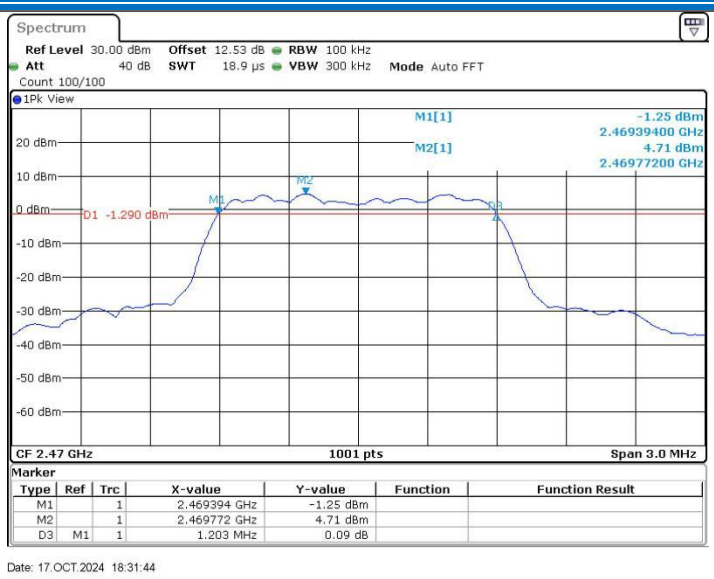
Date: 17.OCT.2024 18:21:25

OFDM_Ant1_2438

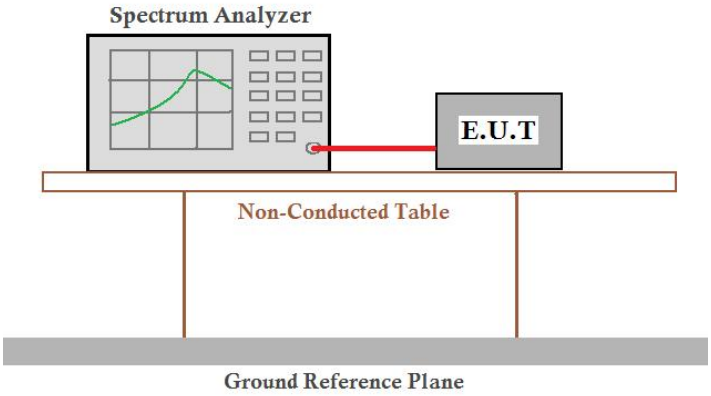


Date: 17.OCT.2024 18:26:43

OFDM_Ant1_2470


Spectrum
Ref Level 30.00 dBm Offset 12.53 dB RBW 100 kHz
Att 40 dB SWT 18.9 µs VBW 300 kHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -1.25 dBm
2.46939400 GHz
M2[1] 4.71 dBm
2.46977200 GHz
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
D1 -1.290 dBm
M1
M2
D3
CF 2.47 GHz
1001 pts
Span 3.0 MHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.469394 GHz -1.25 dBm
M2 1 2.469772 GHz 4.71 dBm
D3 M1 1 1.203 MHz 0.09 dB
Date: 17.OCT.2024 18:31:44

5.5 Power Spectral Density

Test Requirement:	47 CFR Part 15C Section 15.247 (e)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Only the worst case is recorded in the report.
Limit:	≤8.00dBm/3kHz
Test Results:	Pass

Test Result

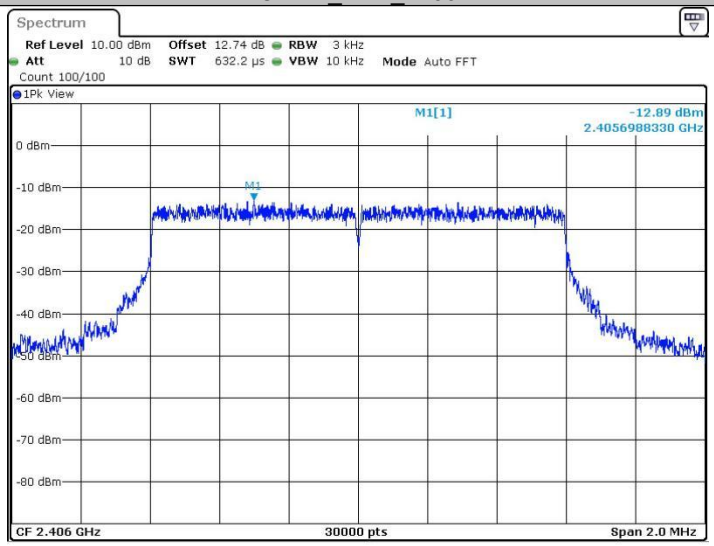
TestMode	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
OFDM	2406	-12.89	≤8.00	PASS
	2438	-11.99	≤8.00	PASS
	2470	-12.03	≤8.00	PASS

Note:

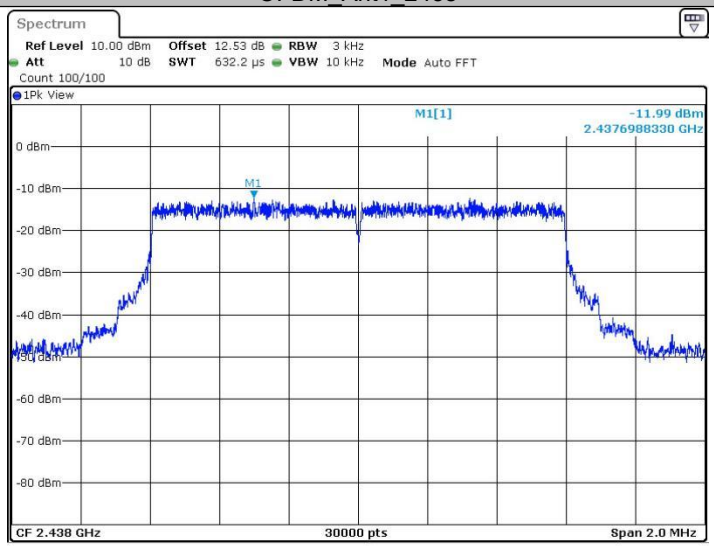
duty factor has been added to the test data

Test Graphs

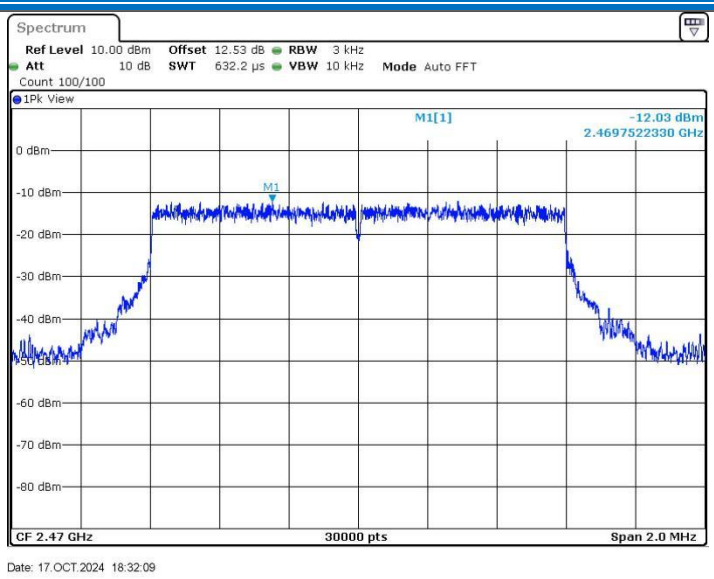
OFDM_Ant1_2406



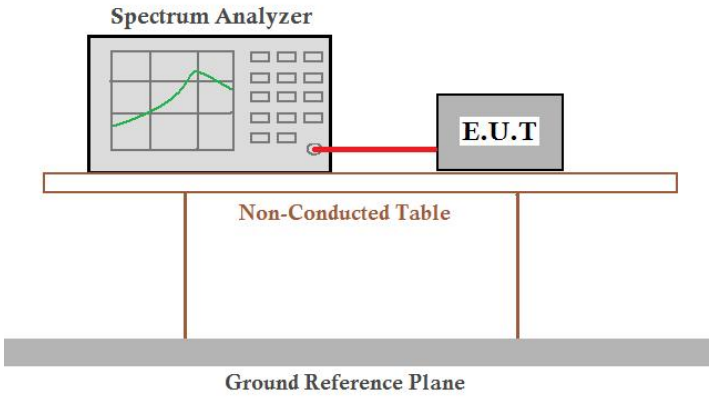
OFDM_Ant1_2438



OFDM_Ant1_2470


Spectrum
Ref Level 10.00 dBm Offset 12.53 dB RBW 3 kHz
Att 10 dB SWT 632.2 µs VBW 10 kHz Mode Auto FFT
Count 100/100
1Pk View
M1[1] -12.03 dBm
2.4697522330 GHz
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-60 dBm
-70 dBm
-80 dBm
M1
CF 2.47 GHz
30000 pts
Span 2.0 MHz
Date: 17.OCT.2024 18:32:09

5.6 Band-edge for RF Conducted Emissions

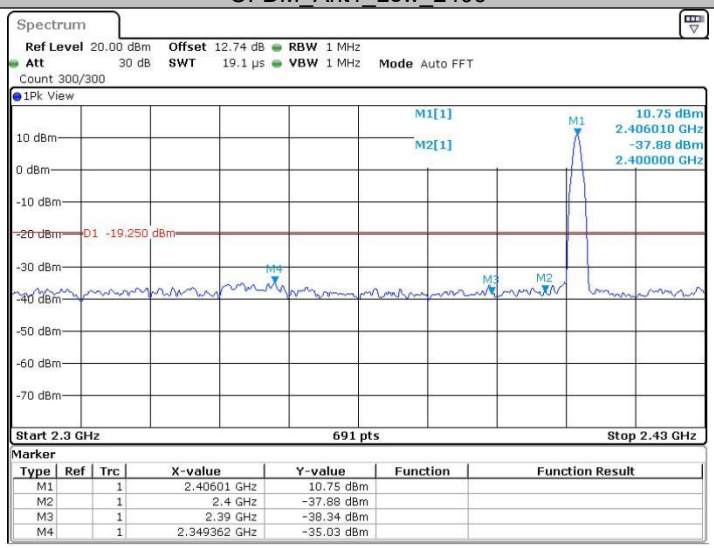
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
. Final Test Mode:	Only the worst case is recorded in the report.
Limit:	In any 100 kHz bandwidth 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 30 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 Results:	Pass

Test Result

TestMode	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
OFDM	Low	2406	10.75	-35.03	≤-19.25	PASS
	High	2470	11.76	-34.69	≤-18.24	PASS

5.6.1 Test Graphs

OFDM_Ant1_Low_2406

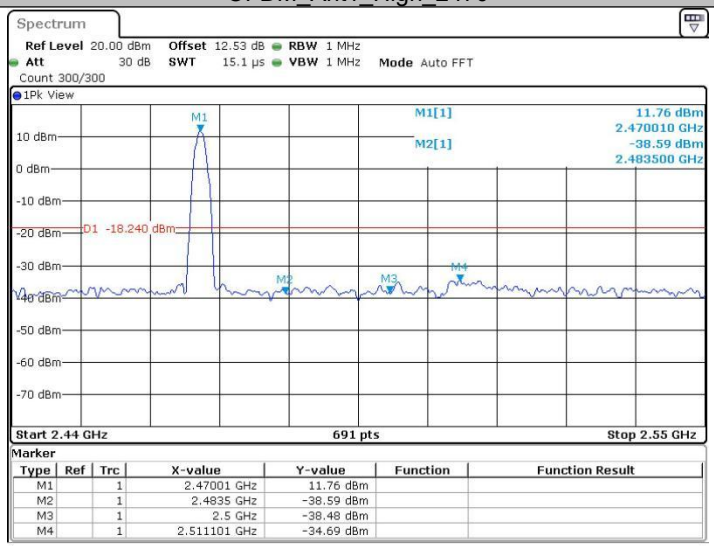


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40601 GHz	10.75 dBm		
M2		1	2.4 GHz	-37.88 dBm		
M3		1	2.39 GHz	-38.34 dBm		
M4		1	2.349362 GHz	-35.03 dBm		

Date: 17.OCT.2024 18:25:17

OFDM_Ant1_High_2470

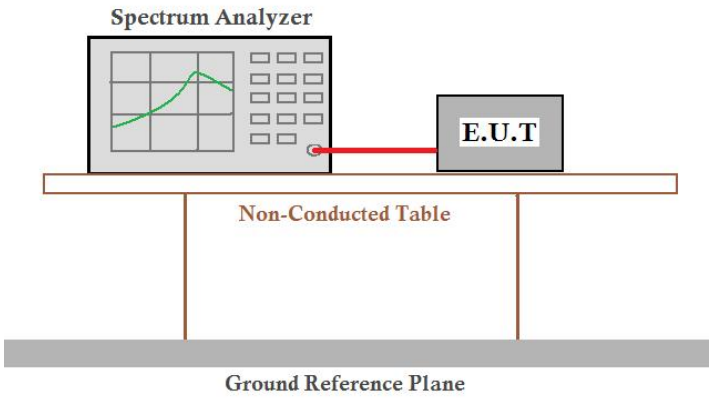


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47001 GHz	11.76 dBm		
M2		1	2.4835 GHz	-38.59 dBm		
M3		1	2.5 GHz	-38.48 dBm		
M4		1	2.511101 GHz	-34.69 dBm		

Date: 17.OCT.2024 18:32:19

5.7 RF Conducted Spurious Emissions

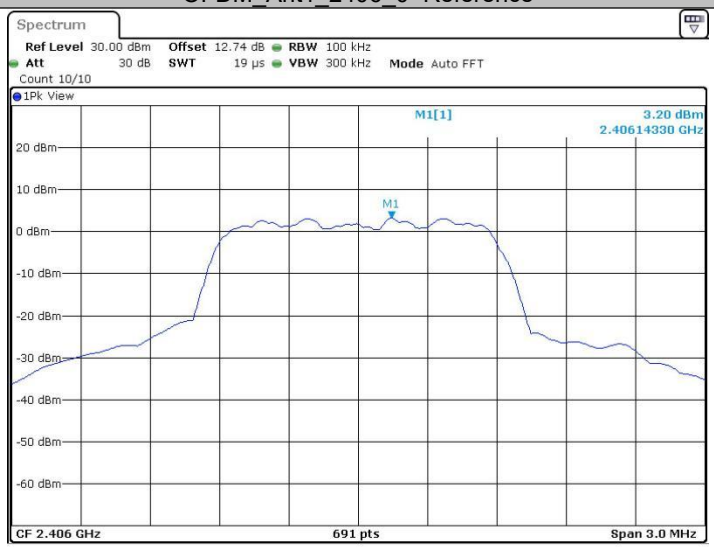
Test Requirement:	47 CFR Part 15C Section 15.247 (d)
Test Method:	ANSI C63.10: 2013
Test Setup:	 Offset=cable loss+ attenuation factor
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates
Final Test Mode:	Only the worst case is recorded in the report.
Limit:	In any 100 kHz bandwidth 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 30 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 Results:	Pass

Test Result

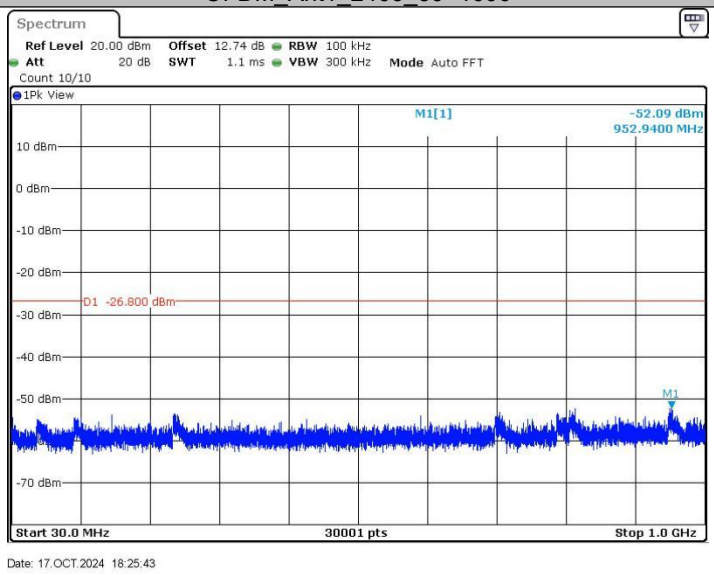
TestMode	Frequency[MHz]	FreqRange [Mhz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
OFDM	2406	Reference	3.20	3.20	---	PASS
		30~1000	3.20	-52.09	≤-26.8	PASS
		1000~26500	3.20	-49.03	≤-26.8	PASS
	2438	Reference	3.60	3.60	---	PASS
		30~1000	3.60	-51.75	≤-26.4	PASS
		1000~26500	3.60	-49.16	≤-26.4	PASS
	2470	Reference	4.42	4.42	---	PASS
		30~1000	4.42	-52.5	≤-25.58	PASS
		1000~26500	4.42	-49.07	≤-25.58	PASS

Test Graphs

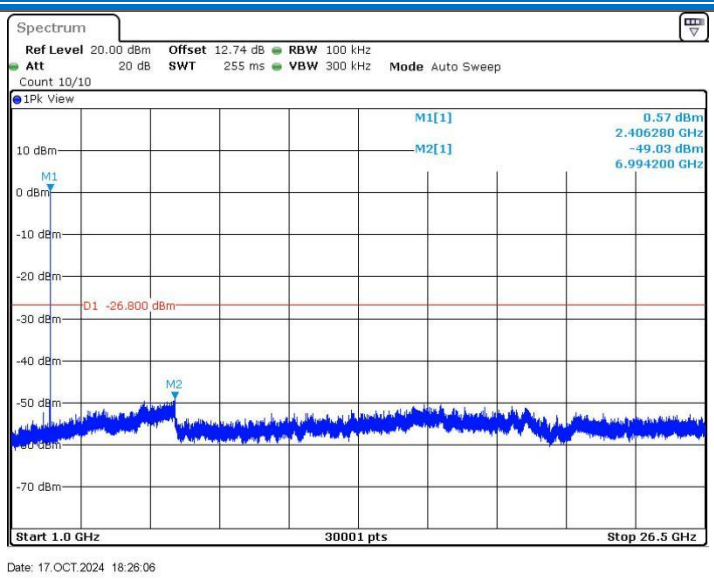
OFDM_Ant1_2406_0~Reference



OFDM_Ant1_2406_30~1000

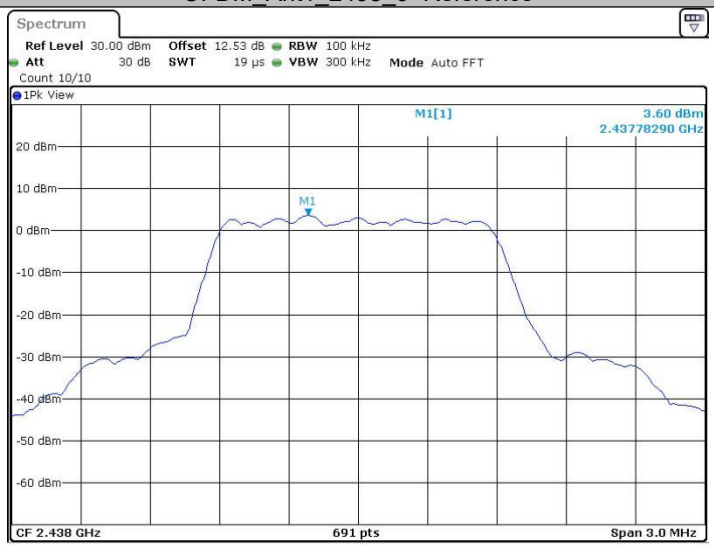


OFDM_Ant1_2406_1000~26500



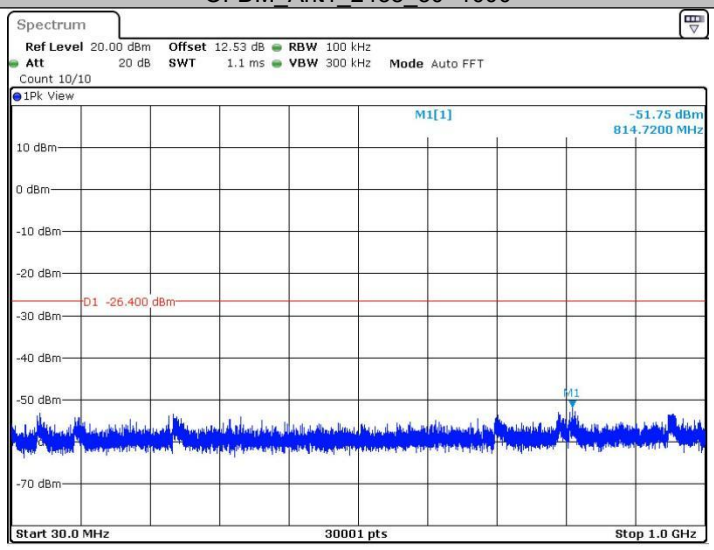
Date: 17.OCT.2024 18:26:06

OFDM_Ant1_2438_0~Reference



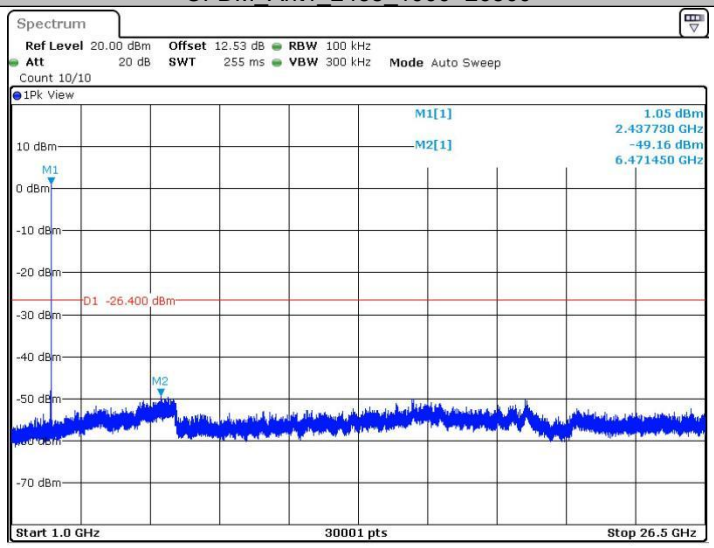
Date: 17.OCT.2024 18:30:22

OFDM_Ant1_2438_30~1000



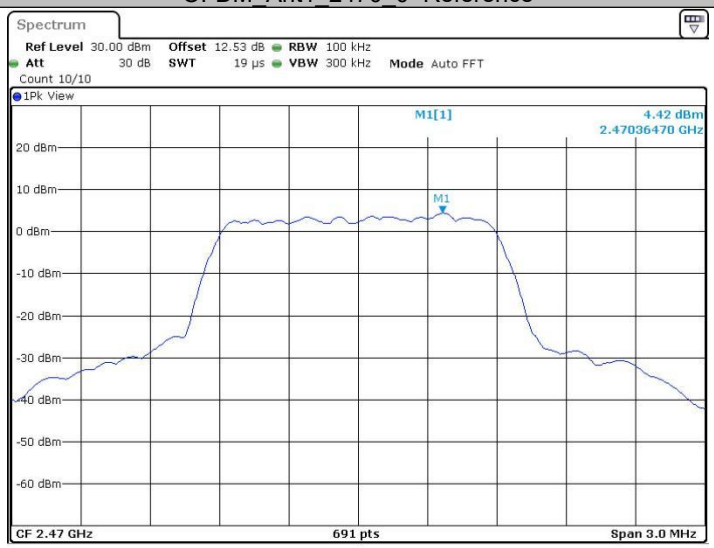
Date: 17.OCT.2024 18:30:28

OFDM_Ant1_2438_1000~26500



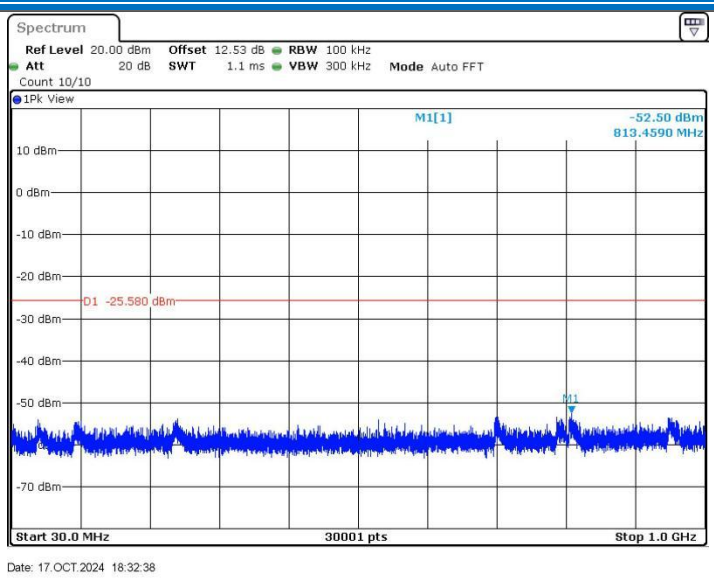
Date: 17.OCT.2024 18:30:51

OFDM_Ant1_2470_0~Reference

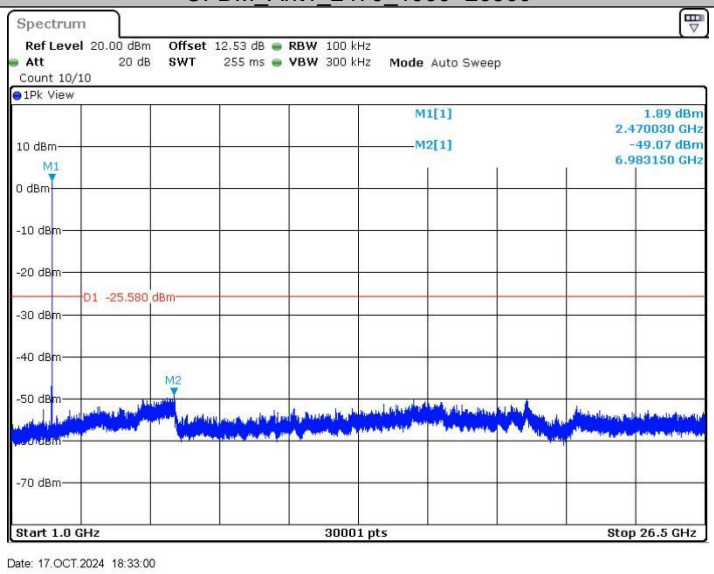


Date: 17.OCT.2024 18:32:31

OFDM_Ant1_2470_30~1000



OFDM_Ant1_2470_1000~26500



Remark:

Pretest 9kHz to 25GHz, find the highest point when testing, so only the worst data were shown in the test report. Per FCC Part 15.33 (a) and 15.31 (o) ,The amplitude of spurious emissions from intentional radiators which are attenuated more than 20 dB below the permissible value need not be reported unless specifically required elsewhere in this part.

5.8 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	10Hz	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:	

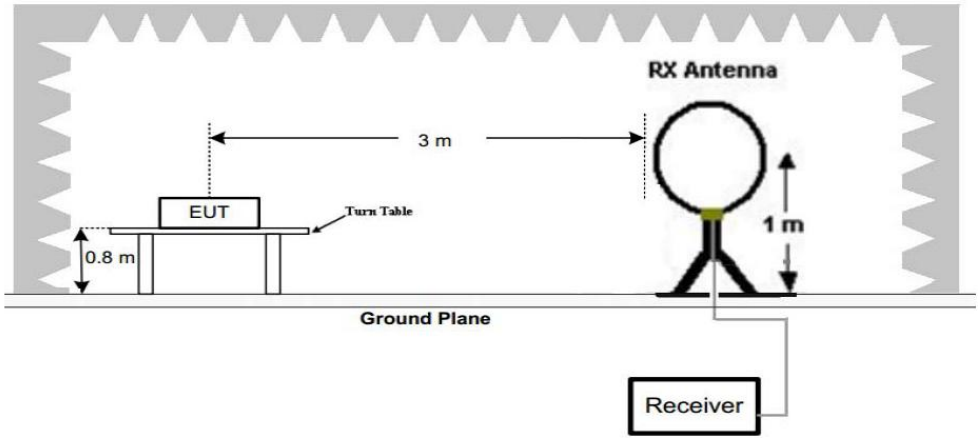


Figure 1. Below 30MHz

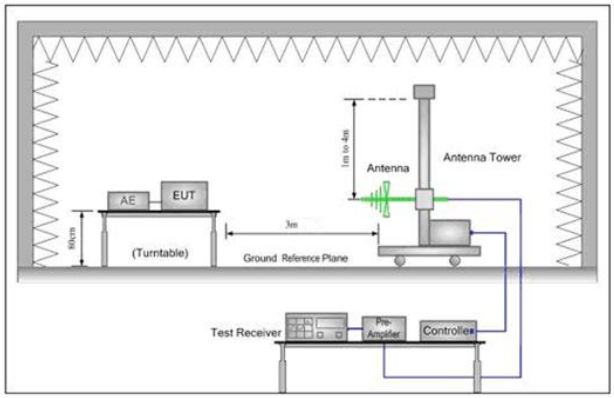


Figure 2. 30MHz to 1GHz

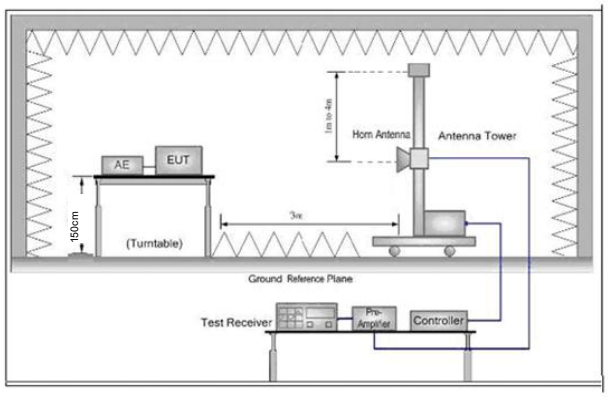


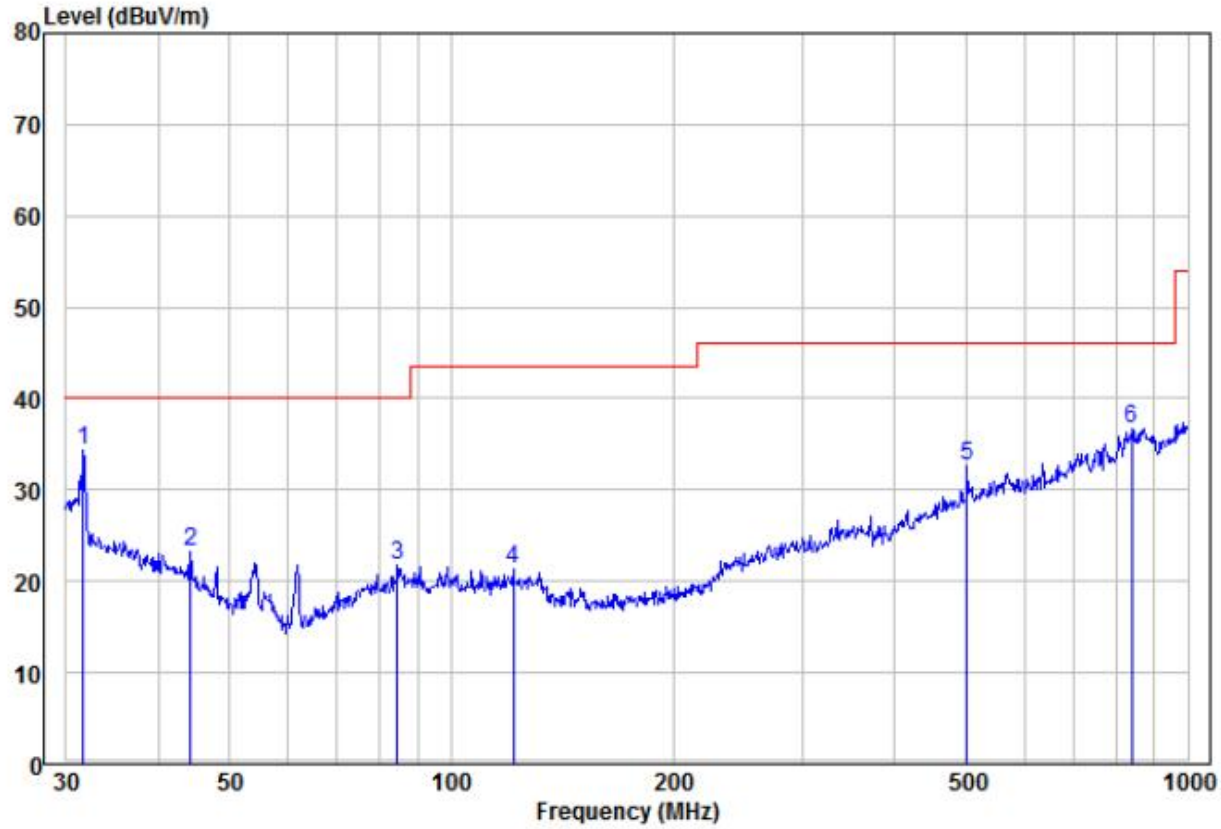
Figure 3. Above 1 GHz

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 camber. 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 camber. 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, the middle channel, the Highest channel. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case . i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates at lowest, middle and highest channel. Through Pre-scan, find the ANT1is the worst case.
Final Test Mode:	Only the worst case is recorded in the report.
Test Results:	Pass

5.8.1 Radiated emission below 1GHz

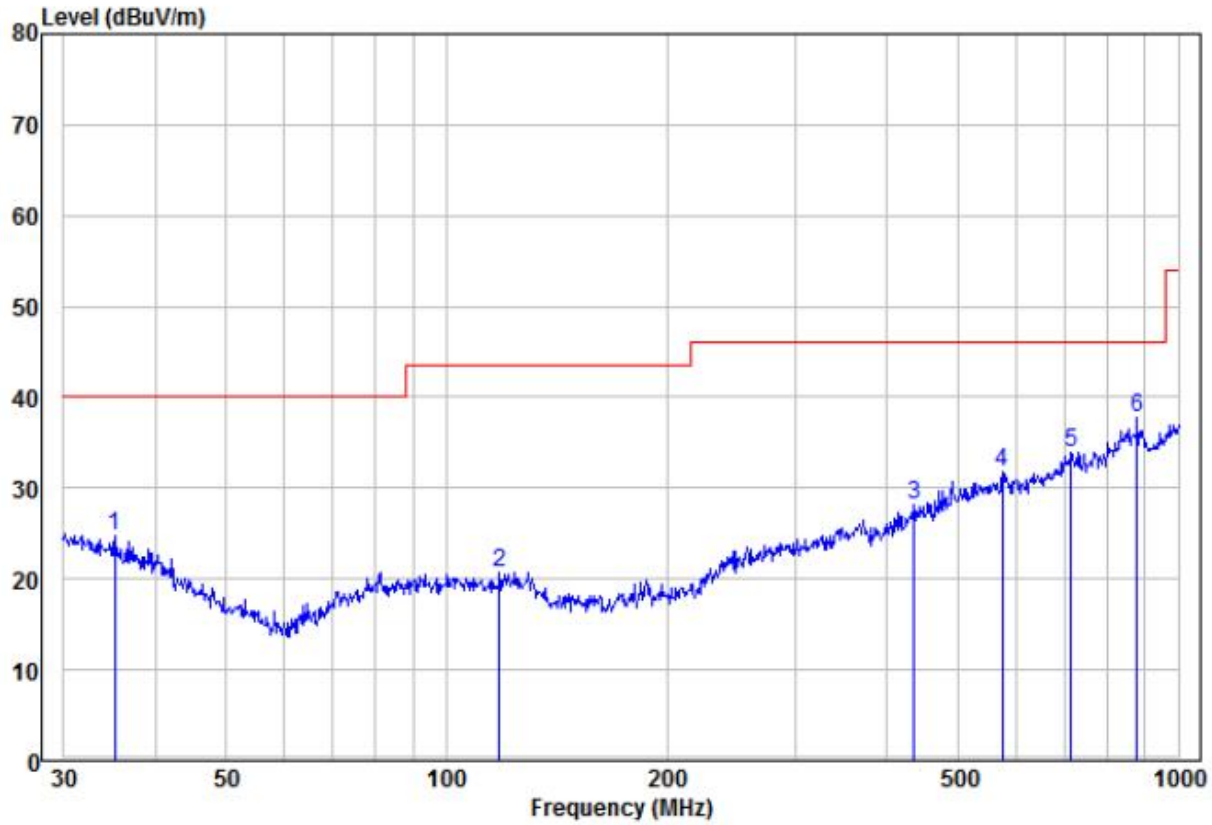
30MHz~1GHz
Vertical



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1 pp	31.62	18.55	15.74	34.29	40.00	-5.71	Peak	VERTICAL
2	44.28	11.78	11.47	23.25	40.00	-16.75	Peak	VERTICAL
3	84.41	10.93	10.84	21.77	40.00	-18.23	Peak	VERTICAL
4	121.55	9.46	11.84	21.30	43.50	-22.20	Peak	VERTICAL
5	501.18	12.23	20.31	32.54	46.00	-13.46	Peak	VERTICAL
6	839.18	9.98	26.81	36.79	46.00	-9.21	Peak	VERTICAL

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,
Level = Read Level + Factor,
Over Limit=Level-Limit Line.

Horizontal



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		
1	35.25	9.78	14.95	24.73	40.00	-15.27	Peak	HORIZONTAL
2	118.19	8.97	11.79	20.76	43.50	-22.74	Peak	HORIZONTAL
3	435.59	10.09	18.09	28.18	46.00	-17.82	Peak	HORIZONTAL
4	574.63	10.49	21.24	31.73	46.00	-14.27	Peak	HORIZONTAL
5	714.17	10.37	23.49	33.86	46.00	-12.14	Peak	HORIZONTAL
6 pp	878.32	10.97	26.76	37.73	46.00	-8.27	Peak	HORIZONTAL

Remark:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
Factor= Antenna Factor + Cable Factor – Preamplifier Factor,
Level = Read Level + Factor,
Over Limit=Level-Limit Line.

5.8.2 Transmitter emission above 1GHz

Test mode:		OFDM		Test channel:		Lowest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4812.000	53.03	-4.26	48.77	74	-25.23	peak	H
4812.000	36.66	-4.26	32.40	54	-21.60	AVG	H
7218.000	51.61	1.18	52.79	74	-21.21	peak	H
7218.000	37.79	1.18	38.97	54	-15.03	AVG	H
4812.000	55.97	-4.26	51.71	74	-22.29	peak	V
4812.000	39.15	-4.26	34.89	54	-19.11	AVG	V
7218.000	51.81	1.18	52.99	74	-21.01	peak	V
7218.000	35.29	1.18	36.47	54	-17.53	AVG	V

Test mode:		OFDM		Test channel:		Middle	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
4876.000	51.61	-4.12	47.49	74	-26.51	peak	H
4876.000	37.17	-4.12	33.05	54	-20.95	AVG	H
7314.000	49.55	1.46	51.01	74	-22.99	peak	H
7314.000	35.25	1.46	36.71	54	-17.29	AVG	H
4876.000	53.22	-4.12	49.10	74	-24.90	peak	V
4876.000	37.00	-4.12	32.88	54	-21.12	AVG	V
7314.000	48.36	1.46	49.82	74	-24.18	peak	V
7314.000	35.55	1.46	37.01	54	-16.99	AVG	V

Test mode:		OFDM		Test channel:		Highest	
Frequency	Meter Reading	Factor	Emission Level	Limits	Over	Detector Type	Ant. Pol.
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)		H/V
4940.000	53.09	-4.03	49.06	74	-24.94	peak	H
4940.000	38.11	-4.03	34.08	54	-19.92	AVG	H
7410.000	49.80	1.66	51.46	74	-22.54	peak	H
7410.000	36.65	1.66	38.31	54	-15.69	AVG	H
4940.000	55.07	-4.03	51.04	74	-22.96	peak	V
4940.000	37.94	-4.03	33.91	54	-20.09	AVG	V
7410.000	50.31	1.66	51.97	74	-22.03	peak	V
7410.000	36.62	1.66	38.28	54	-15.72	AVG	V

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

   Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz,The disturbance above 13GHz 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.

5.9 Restricted bands around fundamental frequency

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)
Limit:	

Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test Setup:

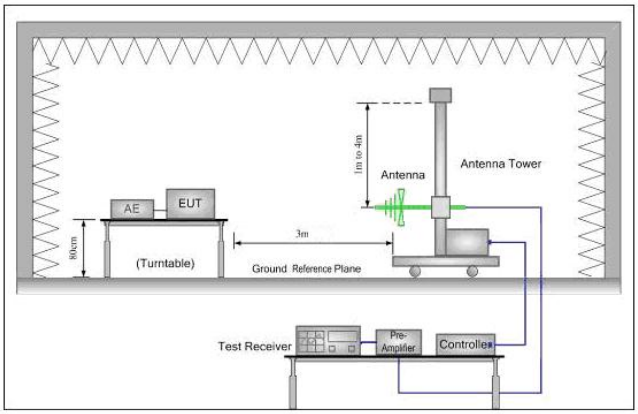


Figure 1. 30MHz to 1GHz

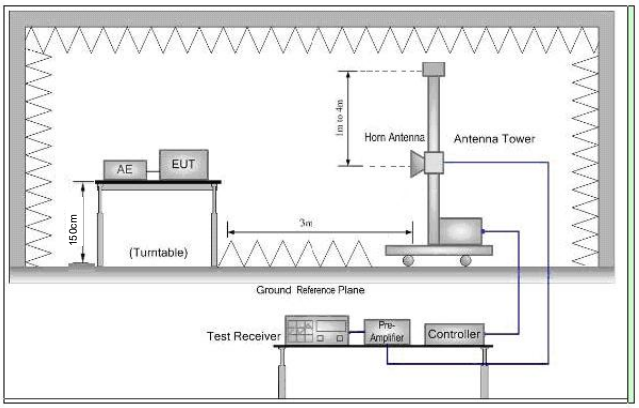


Figure 2. Above 1 GHz

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 camber. 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 camber. 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 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. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel g. Test the EUT in the lowest channel, the middle channel, the Highest channel. h. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode,And found the X axis positioning which it is worse case . i. Repeat above procedures until all frequencies measured was complete.
Exploratory Test Mode:	Transmitting with all kind of modulations, data rates. Transmitting mode.
Final Test Mode:	Through Pre-scan, find the ANT1 is the worst case. Only the worst case is recorded in the report.
Test Results:	Pass

Test data:

Worse case mode:		OFDM		Test channel:		Lowest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2390.000	59.01	-9.2	49.81	74	-24.19	peak	H
2390.000	44.11	-9.2	34.91	54	-19.09	AVG	H
2400.000	59.60	-9.39	50.21	74	-23.79	peak	H
2400.000	46.35	-9.39	36.96	54	-17.04	AVG	H
2390.000	58.39	-9.2	49.19	74	-24.81	peak	V
2390.000	44.50	-9.2	35.30	54	-18.70	AVG	V
2400.000	59.82	-9.39	50.43	74	-23.57	peak	V
2400.000	46.28	-9.39	36.89	54	-17.11	AVG	V

Worse case mode:		OFDM		Test channel:		Highest	
Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Over (dB)	Detector Type	Ant. Pol. H/V
2483.500	57.62	-9.29	48.33	74	-25.67	peak	H
2483.500	44.21	-9.29	34.92	54	-19.08	AVG	H
2483.500	57.75	-9.29	48.46	74	-25.54	peak	V
2483.500	45.54	-9.29	36.25	54	-17.75	AVG	V

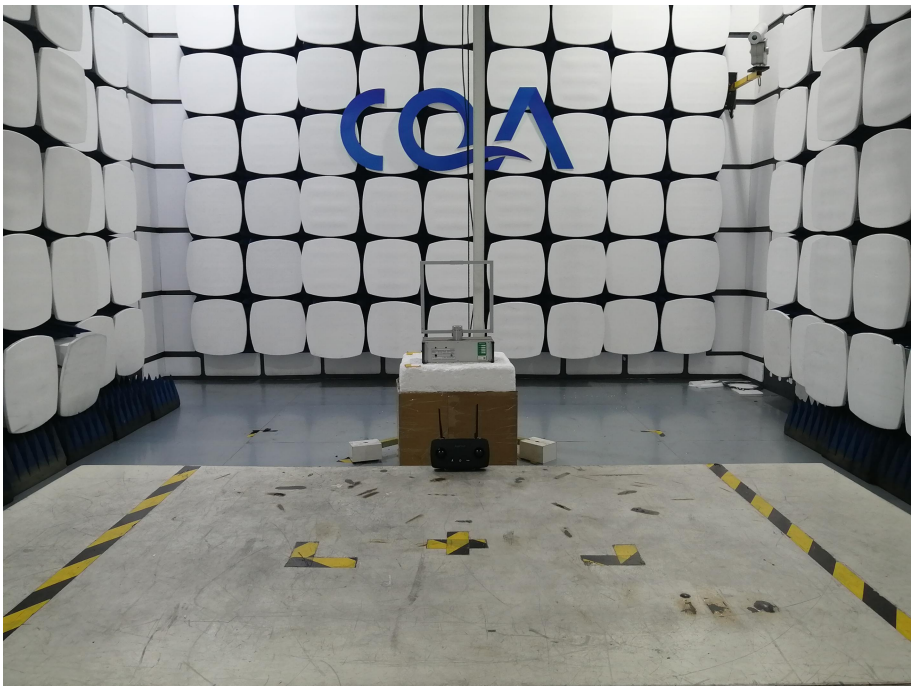
Note:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

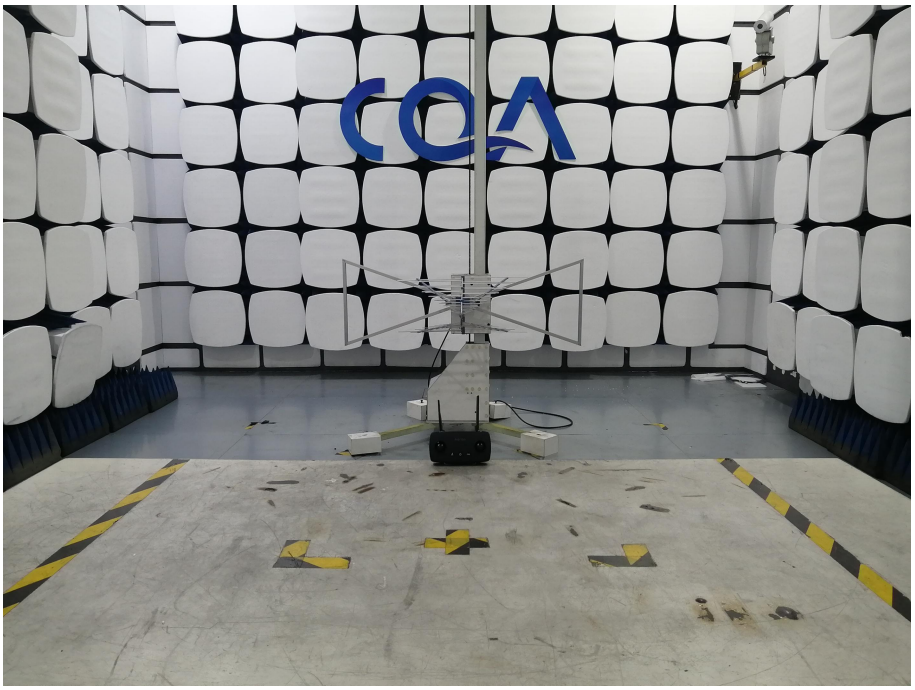
6 Photographs - EUT Test Setup

6.1 Radiated Spurious Emission

9kHz~30MHz:



30MHz~1GHz:



Above 1GHz:

6.2 Conducted Emissions Test Setup

7 Photographs - EUT Constructional Details


Aeroo
F/N/S


Aeroo