TEST REPORT

Product Name:	Smart Door Lock
FCC ID:	2AY4QT01A-TYAZ
Trademark:	LILIWISE
Model Number:	T01A-TYAZ, T01A-TYAB, T01A-TYAW, T01A-TYBB, T01A-TYBZ, T01A-TYBW, T01B-TYAB, T01B-TYAZ, T01B-TYAW, T01B-TYBB, T01B-TYBA, T01B-TYBW
Prepared For:	Guangzhou LightSource Electronics Limited
Address:	No #163, Shixin road, Xingtang town, Zengcheng District, Guangzhou City, Guangdong Province, China
Manufacturer:	Guangzhou LightSource Electronics Limited
Address:	No #163, Shixin road, Xingtang town, Zengcheng District, Guangzhou City, Guangdong Province, China
Prepared By:	Shenzhen CTB Testing Technology Co., Ltd.
Address:	Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China
Sample Received Date:	Sep. 9, 2021
Sample tested Date:	Sep. 9, 2021 to Sep. 26, 2021
Issue Date:	Sep. 26, 2021
Report No.:	CTB210924028RFX
Test Standards	FCC Part15.247 ANSI C63.10:2013
Test Results	PASS
Remark:	This is Zigbee radio test report.

Compiled by:	Reviewed by:	Approved by:
He Xiaona	Arron Liu	Bin Mei / Director

TABLE OF CONTENT

(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB210924028RFX	Sep. 26, 2021	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item	Test Requirement	Test method	Result
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Radiated Spurious emissions	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Band edge and RF Conducted Spurious Emissions	47 CFR Part 15 Subpart C Section 15.247(d)/15.205(a)	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15 Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013	PASS
Bandwidth	47 CFR Part 15 Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013	PASS
Power Spectral Density	47 CFR Part 15Subpart C Section 15.247 (e)	ANSI C63.10-2013/ KDB 558074 D01v04	PASS
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203/15.247 (c)	ANSI C63.10-2013	PASS

Remark:
Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product 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.

Item	Uncertainty
Occupancy bandwidth	54.3kHz
Conducted output power Above 1G	0.9dB
Conducted output power below 1G	0.9dB
Power Spectral Density , Conduction	0.9dB
Conduction spurious emissions	2.0dB
Out of band emission	2.0dB
3m camber Radiated spurious emission(30MHz-1GHz)	4.6dB
3m chamber Radiated spurious emission(1GHz-18GHz)	5.1dB
3m chamber Radiated spurious emission(18GHz-40GHz)	3.4dB
humidity uncertainty	5.5%
Temperature uncertainty	0.63℃
frequency	1×10-7
Conducted Emission (150KHz-30MHz)	3.2 dB
Radiated Emission(30MHz ~ 1000MHz)	4.8 dB
Radiated Emission(1GHz ~6GHz)	4.9 dB

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	T01A-TYAZ, T01A-TYAB, T01A-TYAW, T01A-TYBB, T01A-TYBZ, T01A-TYBW, T01B-TYAB, T01B-TYAZ, T01B-TYAW, T01B-TYBB, T01B-TYBA, T01B-TYBW
Model Description:	All the model are the same circuit and RF module, only for model name. Test sample model: T01A-TYAZ
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	Zigbee: 2405-2480MHz
Max. RF output power:	Zigbee: 4.828dBm
Type of Modulation:	Zigbee: O-QPSK
Antenna installation:	Zigbee: PCB antenna
Antenna Gain:	Zigbee: 1dBi
Ratings:	DC 5V charging from adapter DC 6V for battery

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type	Series	Note
1	AC adapter	SHENZEHN ENGINE ELECTRONIC CO.,LTD	EE-0501000E	N/A	AE

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer’s requirements and conditions for the intended use.

4.4 Channel List

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
11	2405MHz	15	2425MHz	19	2445MHz	23	2465MHz
12	2410MHz	16	2430MHz	20	2450MHz	24	2470MHz
13	2415MHz	17	2435MHz	21	2455MHz	25	2475MHz
14	2420MHz	18	2445MHz	22	2460MHz	26	2480MHz

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting (O-QPSK)	2405MHz	2445MHz	2480MHz
Receiving(O-QPSK)	2405MHz	2445MHz	2480MHz

4.6 Test Environment

Humidity(%):	55
Atmospheric Pressure(kPa):	101.1
Normal Voltage(DC):	6V
Normal Temperature(℃)	25
Low Temperature(℃)	0
High Temperature(℃)	40

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2021.09.27
2	Power Sensor	Agilent	U2021XA	MY56120032	2021.09.27
3	Power Sensor	Agilent	U2021XA	MY56120034	2021.09.27
4	Communication test set	R&S	CMW500	108058	2021.09.27
5	Spectrum Analyzer	R&S	FSP40	100550	2021.09.27
6	Signal Generator	Agilent	N5181A	MY49060920	2021.09.27
7	Signal Generator	Agilent	N5182A	MY47420195	2021.09.27
8	Communication test set	Agilent	E5515C	MY50102567	2021.09.27
9	band rejection filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	2021.09.27
10	band rejection filter	Shenxiang	MSF5150-5850MS-1155	20181015001	2021.09.27
11	band rejection filter	Xingbo	XBLBQ-DZA120	190821-1-1	2021.09.27
12	BT&WI-FI Automatic test software	Micowave	MTS8310	Ver. 2.0.0.0	2021.09.27
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2021.09.27
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2021.09.27
15	234G Automatic test software	Micowave	MTS8200	Ver. 2.0.0.0	2021.09.27
16	966 chamber	C.R.T.	966 Room	966	2021.09.27
17	Receiver	R&S	ESPI	100362	2021.09.27
18	Amplifier	HP	8447E	2945A02747	2021.09.27
19	Amplifier	Agilent	8449B	3008A01838	2021.09.27
20	TRILOG Broadband	Schwarzbeck	VULB 9163	869	2021.09.27

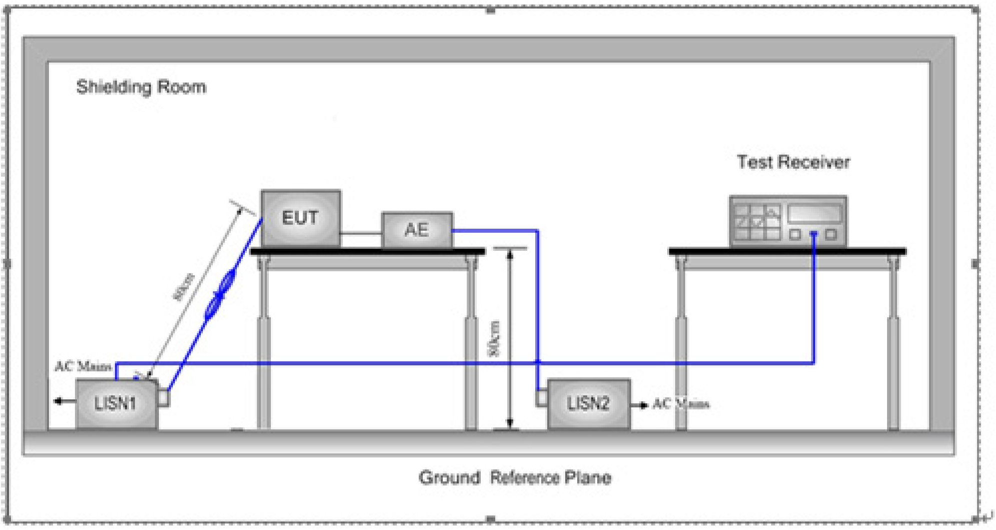
	Antenna				
21	Horn Antenna	Schwarzbeck	BBHA9120D	1911	2021.09.27
22	Software	Fala	EZ-EMC	FA-03A2 RE	2021.09.27
23	3-Loop Antenna	Daze	ZN30401	17014	2021.09.27
24	loop antenna	ZHINAN	ZN30900A	/	2021.09.27
25	Horn antenna	A/H/System	SAS-574	588	2021.09.27
26	Amplifier	AEROFLEX	/	S/N/ 097	2021.09.27

Continuous disturbance					
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	AMN	ROHDE&SCHWARZ	ESH3-Z5	831551852	2021.09.27
2	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	2021.09.27
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCS30	834115/006	2021.09.27
4	Coaxial cable	ZDECL	Z302S	18091904	2021.09.27
5	AAN	Schwarzbeck	NTFM8158	183	2021.09.27
6	Communication test set	Agilent	E5515C	MY50102567	2021.09.27
7	Communication test set	R&S	CMW500	108058	2021.09.27
8	EZ-EMC	Frad	EMC-con3A1.1	/	/

Radiated emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	1911	2021.11.01
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	869	2021.11.01
3	Amplifier	Agilent	8449B	3008A01838	2021.09.27
4	Amplifier	HP	8447E	2945A02747	2021.09.27
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI7	100362	2021.09.27
6	Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2021.09.27
7	Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2021.09.27
8	Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2021.09.27
9	Coaxial cable	ETS	RFC-NNS-100-NMS-30 0 NI	/	2021.09.27
10	Communication test set	Agilent	E5515C	MY50102567	2021.09.27
11	Communication test set	R&S	CMW500	108058	2021.09.27
12	EZ-EMC	Frad	EMC-con3A1.1	/	/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

6.3 Test procedure

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.

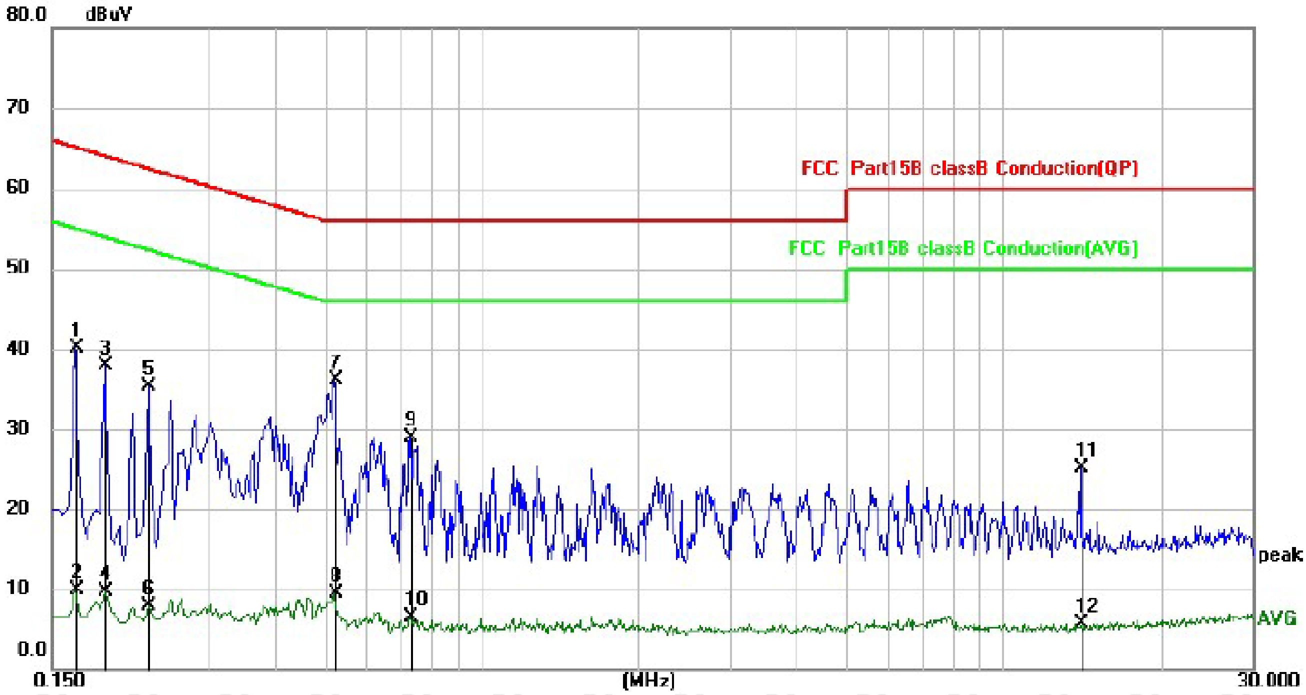
5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

6) All modes were tested at AC 120V and 240V, only the worst result of AC 120V 60Hz was reported.

7) If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.

6.4 Test Result

Test Specification: Neutral

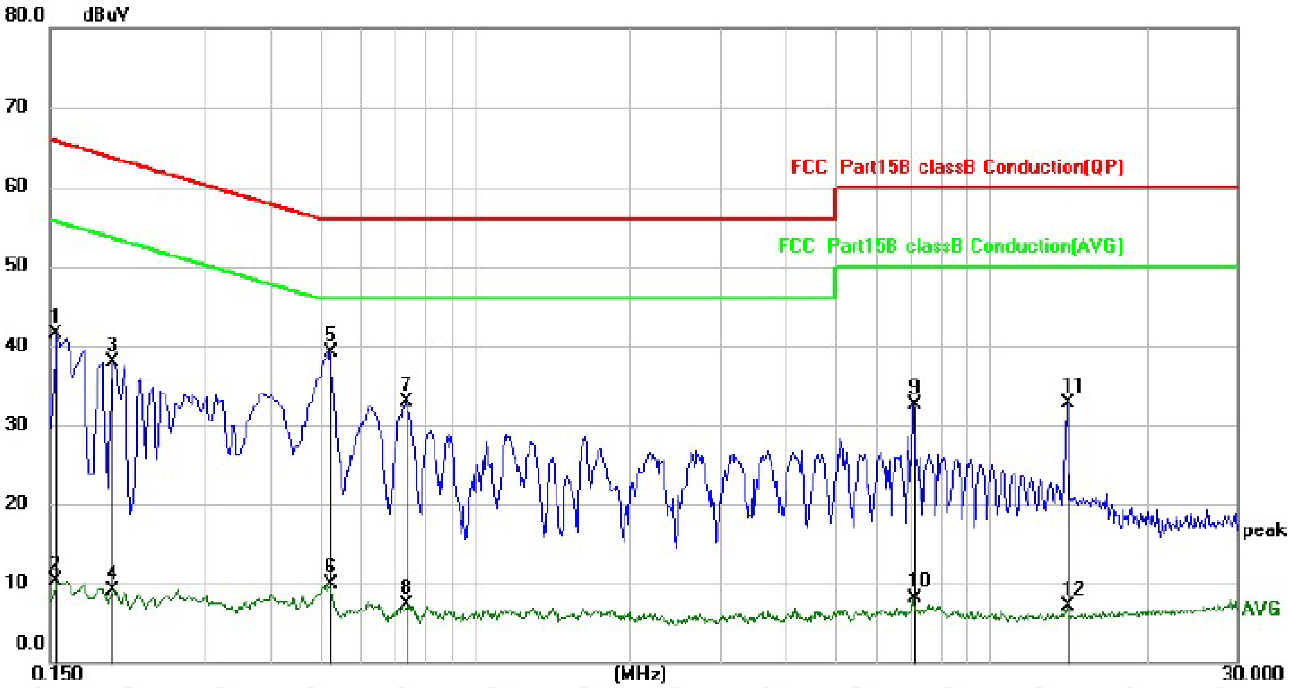


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1660	30.05	9.96	40.01	65.16	-25.15	QP
2		0.1660	-0.12	9.96	9.84	55.16	-45.32	AVG
3		0.1900	27.98	9.96	37.94	64.04	-26.10	QP
4		0.1900	-0.18	9.96	9.78	54.04	-44.26	AVG
5		0.2300	25.42	9.96	35.38	62.45	-27.07	QP
6		0.2300	-1.97	9.96	7.99	52.45	-44.46	AVG
7	*	0.5220	26.12	9.96	36.08	56.00	-19.92	QP
8		0.5220	-0.53	9.96	9.43	46.00	-36.57	AVG
9		0.7300	19.04	9.96	29.00	56.00	-27.00	QP
10		0.7300	-3.45	9.96	6.51	46.00	-39.49	AVG
11		14.0940	14.17	10.94	25.11	60.00	-34.89	QP
12		14.0940	-5.23	10.94	5.71	50.00	-44.29	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

Test Specification: Line



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1539	31.47	9.96	41.43	65.79	-24.36	QP
2		0.1539	0.30	9.96	10.26	55.79	-45.53	AVG
3		0.1980	27.95	9.96	37.91	63.69	-25.78	QP
4		0.1980	-0.78	9.96	9.18	53.69	-44.51	AVG
5	*	0.5220	29.07	9.96	39.03	56.00	-16.97	QP
6		0.5220	-0.14	9.96	9.82	46.00	-36.18	AVG
7		0.7340	22.87	9.96	32.83	56.00	-23.17	QP
8		0.7340	-2.75	9.96	7.21	46.00	-38.79	AVG
9		7.0940	22.13	10.43	32.56	60.00	-27.44	QP
10		7.0940	-2.23	10.43	8.20	50.00	-41.80	AVG
11		14.0860	21.75	10.94	32.69	60.00	-27.31	QP
12		14.0860	-3.76	10.94	7.18	50.00	-42.82	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

7. RADIATED SPURIOUS EMISSION

7.1 Block Diagram Of Test Setup

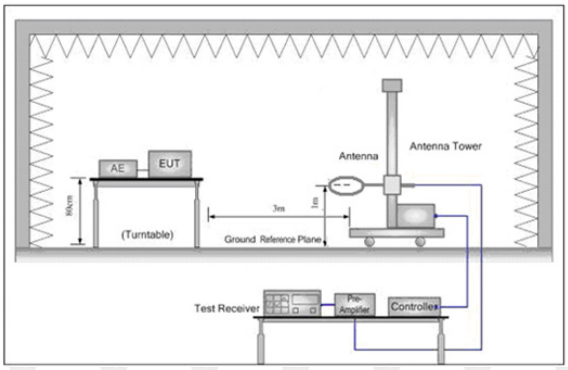


Figure 1. Below 30MHz

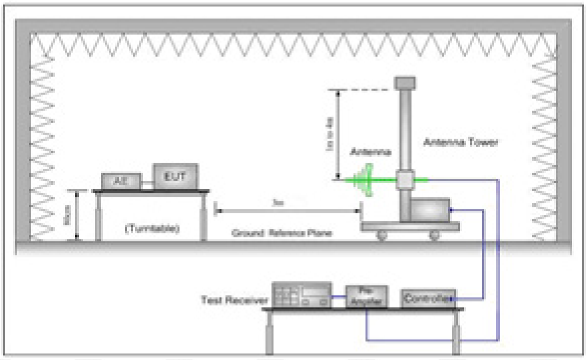
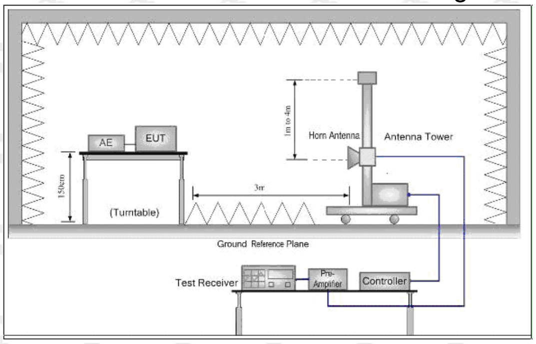


Figure 2. 30MHz to 1GHz



7.2 Limit

Spurious Emissions:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/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.

7.3 Test procedure

Below 1GHz test procedure as below:

a.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.
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 rota table 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.

Above 1GHz test procedure as below:

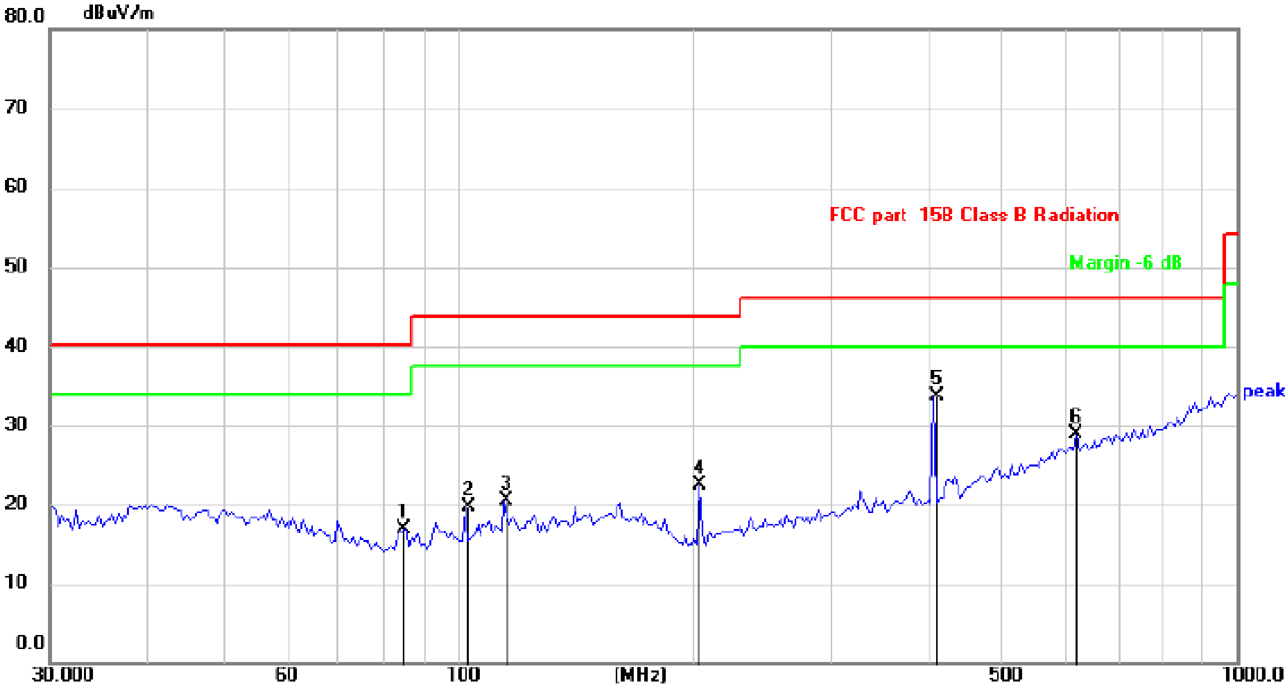
g.Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
h.Test the EUT in the lowest channel ,the middle channel ,the Highest channel
j.Repeat above procedures until all frequencies measured was complete.
j. Full battery is usedduring test

Receiver set:

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	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

7.4 Test Result

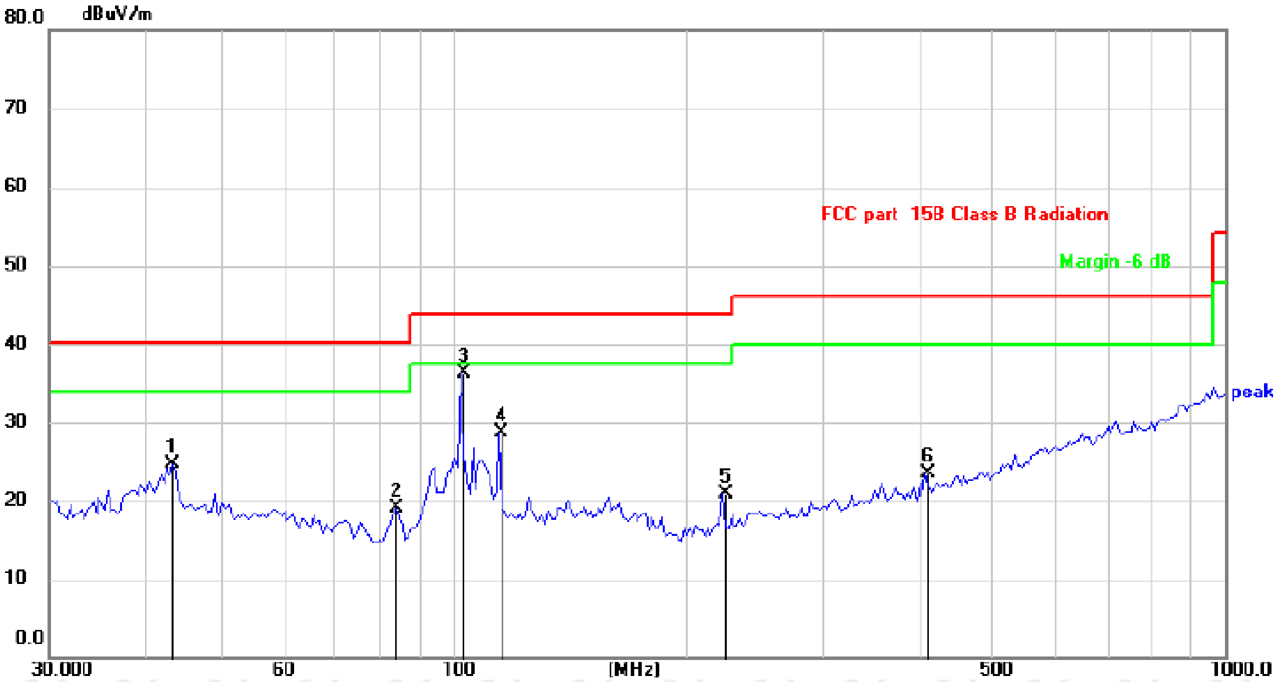
Below 1GHz Test Results:
Antenna polarity: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		85.1486	28.19	-11.38	16.81	40.00	-23.19	QP
2		102.3597	29.77	-10.15	19.62	43.50	-23.88	QP
3		114.7156	29.47	-9.01	20.46	43.50	-23.04	QP
4		204.5961	32.54	-10.05	22.49	43.50	-21.01	QP
5	*	408.9460	38.12	-4.45	33.67	46.00	-12.33	QP
6		622.8900	27.58	1.25	28.83	46.00	-17.17	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

Antenna polarity: V



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		43.3534	31.63	-6.88	24.75	40.00	-15.25	QP
2		84.4054	30.56	-11.41	19.15	40.00	-20.85	QP
3	*	102.3597	46.53	-10.15	36.38	43.50	-7.12	QP
4		114.7156	37.80	-9.01	28.79	43.50	-14.71	QP
5		223.3415	29.81	-8.99	20.82	43.50	-22.68	QP
6		408.9460	27.90	-4.45	23.45	46.00	-22.55	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Measurement – Limit

Above 1 GHz Test Results:

CH Low (2405MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Type
2405	110.16	-5.84	104.32	N/A	N/A	peak
2405	93.40	-5.84	87.56	N/A	N/A	AVG
4810	57.70	-3.64	54.06	74	-19.94	peak
4810	49.04	-3.64	45.40	54	-8.60	AVG
7215	58.23	-0.95	57.28	74	-16.72	peak
7215	49.31	-0.95	48.36	54	-5.64	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Type
2405	110.69	-5.84	104.85	N/A	N/A	peak
2405	92.60	-5.84	86.76	N/A	N/A	AVG
4810	57.40	-3.64	53.76	74	-20.24	peak
4810	49.31	-3.64	45.67	54	-8.33	AVG
7215	58.36	-0.95	57.41	74	-16.59	peak
7215	49.59	-0.95	48.64	54	-5.36	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH Middle (2445MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2445	106.89	-5.71	101.18	N/A	N/A	peak
2445	91.61	-5.71	85.90	N/A	N/A	AVG
4890	54.74	-3.51	51.23	74	-22.77	peak
4890	45.28	-3.51	41.77	54	-12.23	AVG
7335	57.29	-0.82	56.47	74	-17.53	peak
7335	47.13	-0.82	46.31	54	-7.69	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2445	106.40	-5.71	100.69	N/A	N/A	peak
2445	93.01	-5.71	87.30	N/A	N/A	AVG
4890	55.45	-3.51	51.94	74	-22.06	peak
4890	45.86	-3.51	42.35	54	-11.65	AVG
7335	56.99	-0.82	56.17	74	-17.83	peak
7335	46.24	-0.82	45.42	54	-8.58	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH High (2480MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480	108.27	-5.65	102.62	N/A	N/A	peak
2480	92.45	-5.65	86.80	N/A	N/A	AVG
4960	56.01	-3.43	52.58	74	-21.42	peak
4960	46.34	-3.43	42.91	54	-11.09	AVG
7440	55.99	-0.75	55.24	74	-18.76	peak
7440	46.58	-0.75	45.83	54	-8.17	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2480	105.99	-5.65	100.34	N/A	N/A	peak
2480	92.55	-5.65	86.90	N/A	N/A	AVG
4960	54.88	-3.43	51.45	74	-22.55	peak
4960	46.76	-3.43	43.33	54	-10.67	AVG
7440	55.73	-0.75	54.98	74	-19.02	peak
7440	46.56	-0.75	45.81	54	-8.19	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Remark:
(1) Measuring frequencies from 1 GHz to the 25 GHz.
(2). All modes of O-QPSK were test at Low, Middle, and High channel, only the worst result of O-QPSK Low Channel was reported for below 1GHz test.
(3). For BT above 1GHz test all modes of O-QPSK were test at Low, Middle, and High channel, only the worst result of O-QPSK was reported.
(4). By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.
(5). Radiated emission test from 9kHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9kHz to 30MHz and not recorded in this report.

Restricted bands around fundamental frequency (Radiated)

Operation Mode: TX CH Low (2405MHz)
Horizontal (Worst case)

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	53.17	-5.81	47.36	74	-26.64	peak
2310	/	-5.81	/	54	/	AVG
2390	54.75	-5.84	48.91	74	-25.09	peak
2390	/	-5.84	/	54	/	AVG
2400	54.49	-5.84	48.65	74	-25.35	peak
2400	/	-5.84	/	54	/	AVG

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2310	56.05	-5.81	50.24	74	-23.76	peak
2310	/	-5.81	/	54	/	AVG
2390	55.95	-5.84	50.11	74	-23.89	peak
2390	/	-5.84	/	54	/	AVG
2400	57.26	-5.84	51.42	74	-22.58	peak
2400	/	-5.84	/	54	/	AVG

Operation Mode: TX CH High (2480MHz)
Horizontal (Worst case)

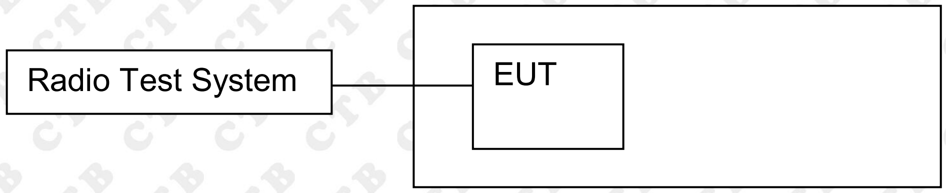
Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	54.47	-5.65	48.82	74	-25.18	peak
2483.50	/	-5.65	/	54	/	AVG
2500.00	54.38	-5.65	48.73	74	-25.27	peak
2500.00	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Reading Result (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	56.07	-5.65	50.42	74	-23.58	peak
2483.50	/	-5.65	/	54	/	AVG
2500.00	54.89	-5.65	49.24	74	-24.76	peak
2500.00	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

8. BAND EDGE AND RF COUNDUCTED SPURIOUS EMISSIONS

8.1 Block Diagram Of Test Setup



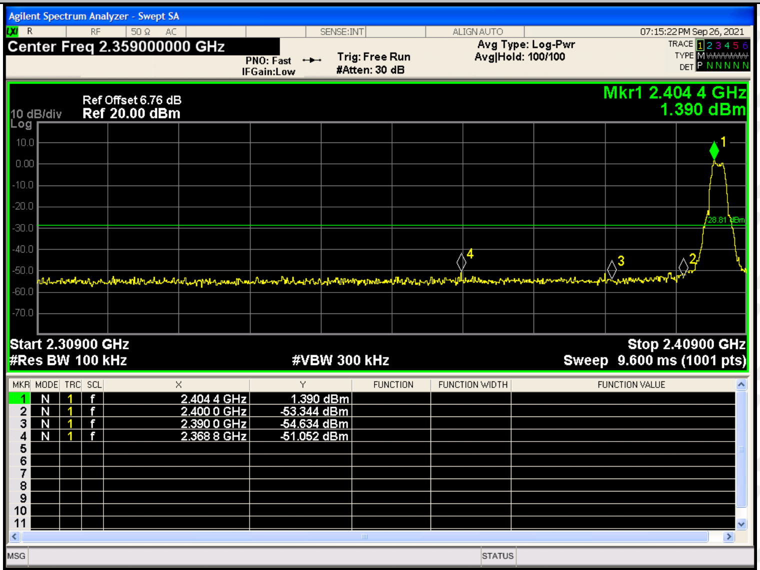
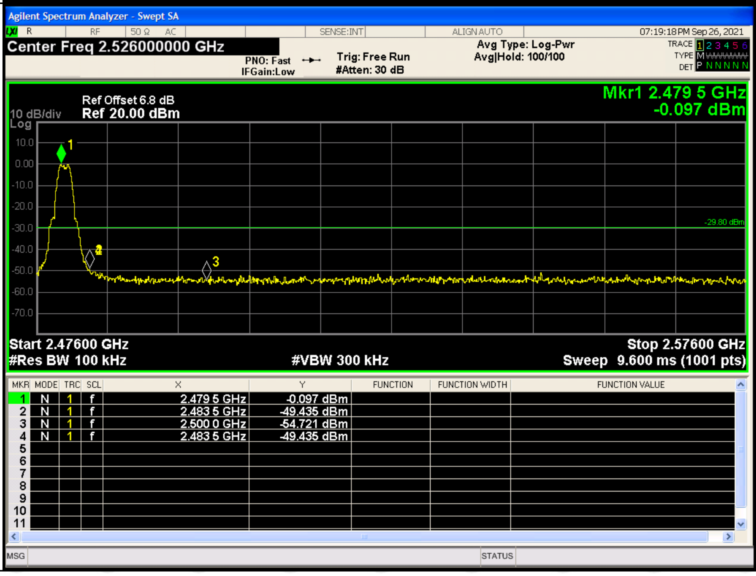
8.2 Limit

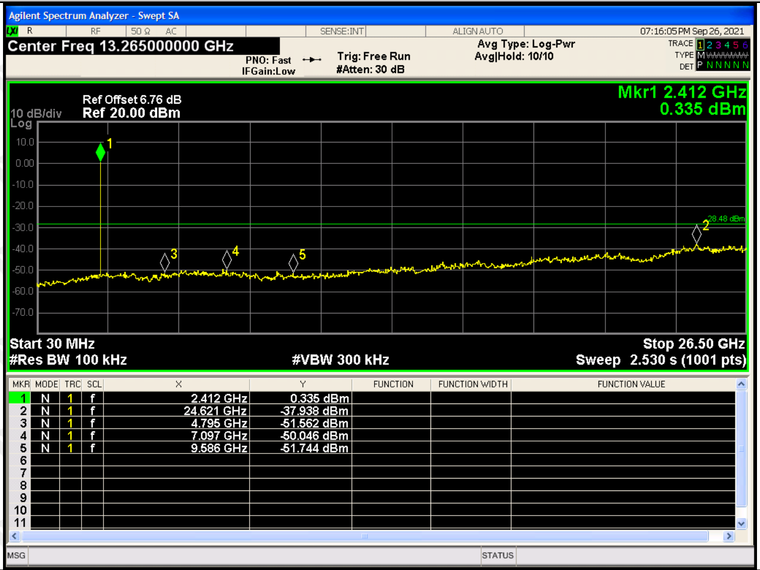
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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. 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)).

8.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
Blow 30MHz:
RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold
Above 30MHz:
RBW = 100KHz, VBW = 300KHz, Sweep = auto
Detector function = peak, Trace = max hold

8.4 Test Result

BAND EDGE Graphs		
2405		
2480		

<table>
<tr><th colspan="3">RF Conducted Spurious Emissions Graphs</th></tr>
<tr><td>2405</td><td></td><td>
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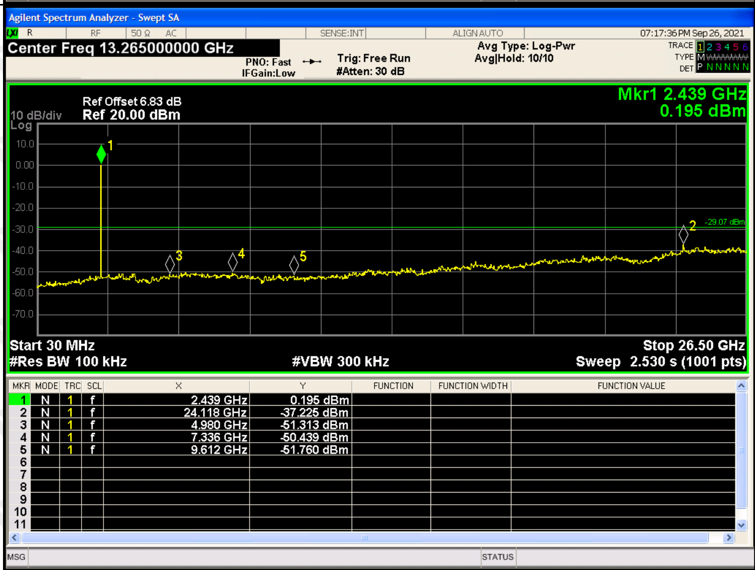
<tr><td>2445</td><td></td><td>
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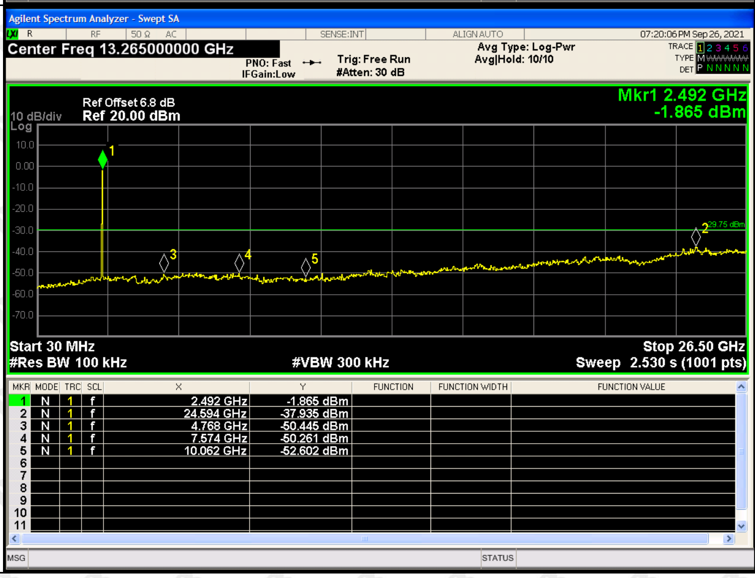
<tr><td>2480</td><td></td><td>
</td></tr>
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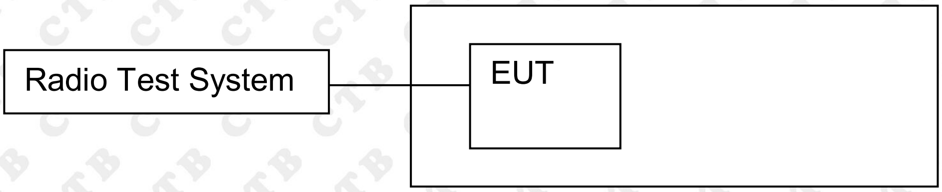
9. COUDUCTED OUTPUT POWER

9.1 Block Diagram Of Test Setup



9.2 Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Output Power	1 watt or 30dBm	2400-2483.5	PASS

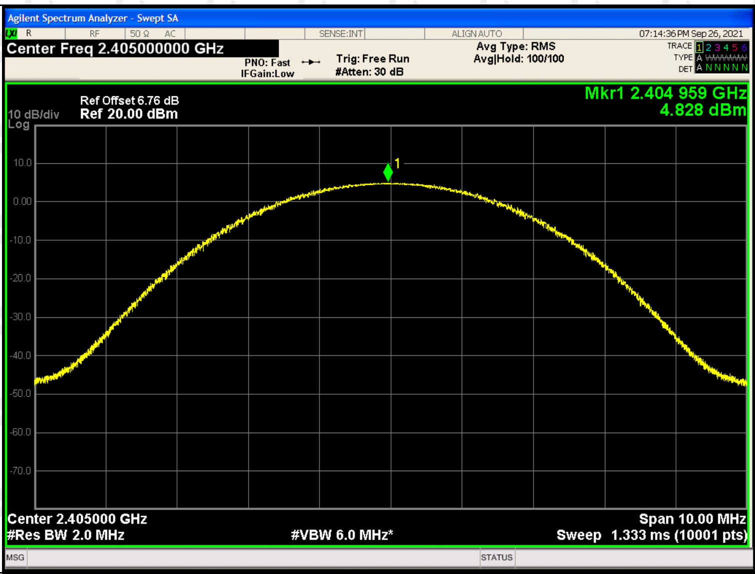
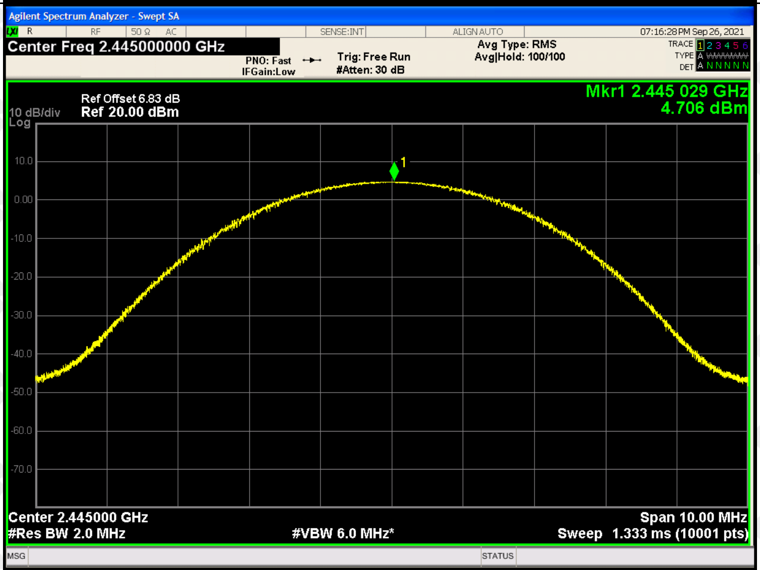
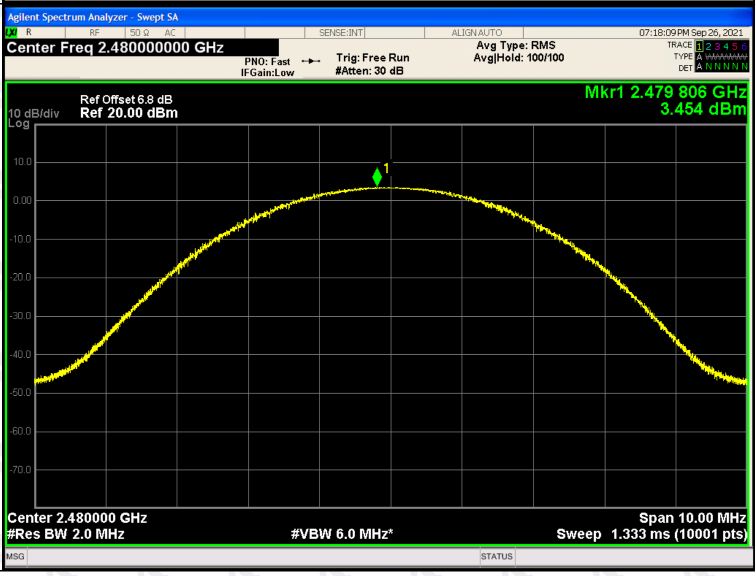
9.3 Test procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 2MHz. VBW = 6MHz. Channel power measurement. Sweep = auto; Detector Function = RMS.
3. Keep the EUT in transmitting at lowest, middle and highest channel individually. Record the max value.

9.4 Test Result

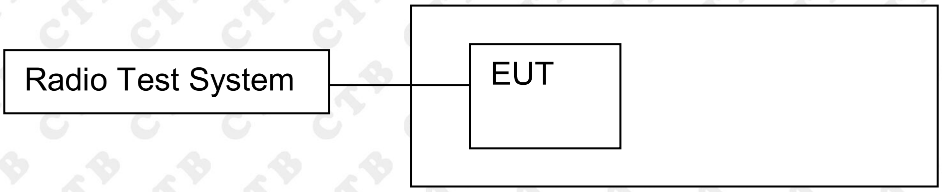
Mode	Channel.	Maximum Output Power [dBm]	Limit[dBm]	Verdict
O-QPSK	2405	4.828	30	PASS
	2445	4.706	30	PASS
	2480	3.454	30	PASS

Test Graph:

2405		
2445		
2480		

10. 6DB OCCUPIED BANDWIDTH

10.1 Block Diagram Of Test Setup



10.2 Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	>= 500KHz (6dB bandwidth)	2400-2483.5	PASS

10.3 Test procedure

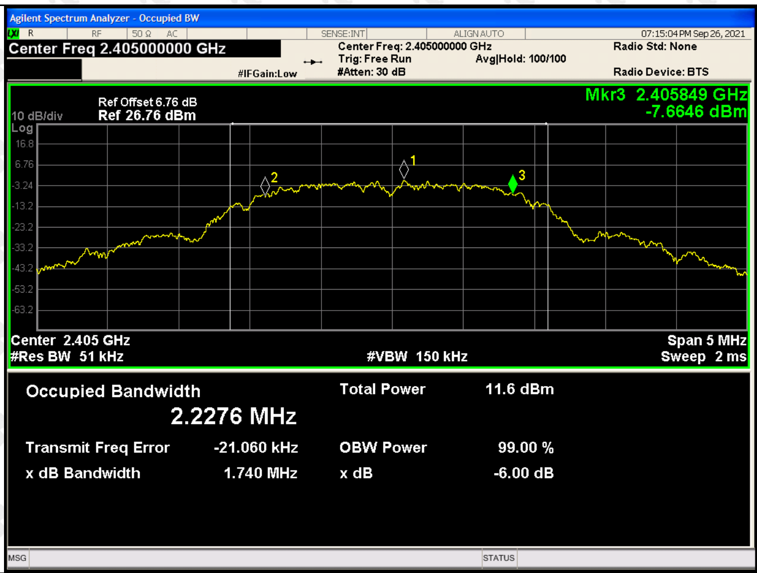
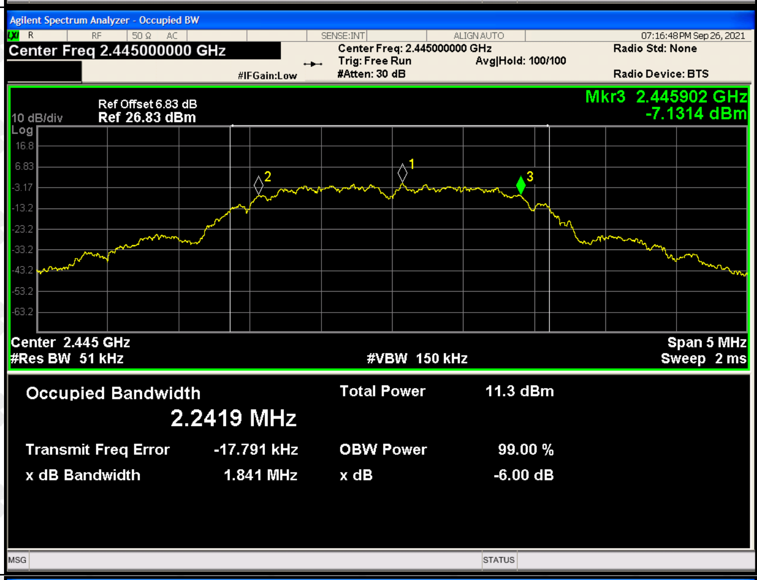
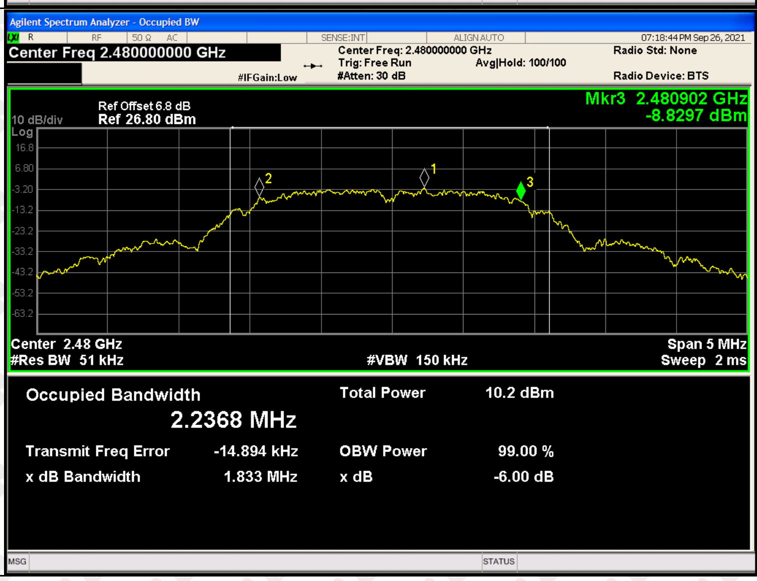
1. Rem1. Set RBW = 30 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

10.4 Test Result

Test Mode	Frequency	6dB Bandwidth (MHz)	Result
O-QPSK	2405	1.74	PASS
	2445	1.841	PASS
	2480	1.833	PASS

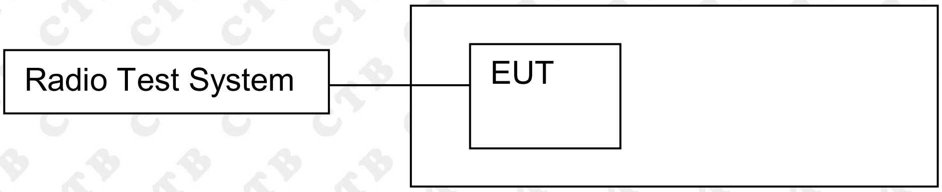
Note: All modes of operation were Pre-scan and the worst-case emissions are reported.

Test Graph:

<table>
<tr><td>2405</td><td></td><td>
</td></tr>
<tr><td>2445</td><td></td><td>
</td></tr>
<tr><td>2480</td><td></td><td>
</td></tr>
</table>

11. POWER SPECTRAL DENSITY

11.1 Block Diagram Of Test Setup



11.2 Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

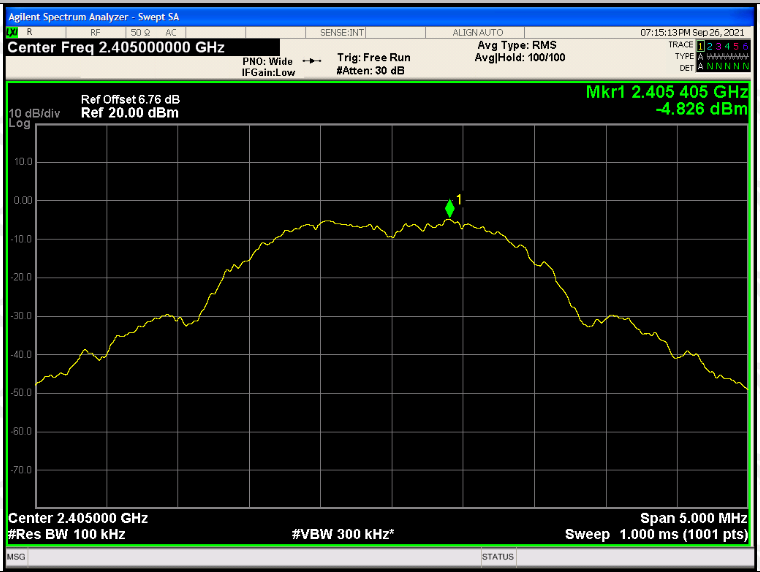
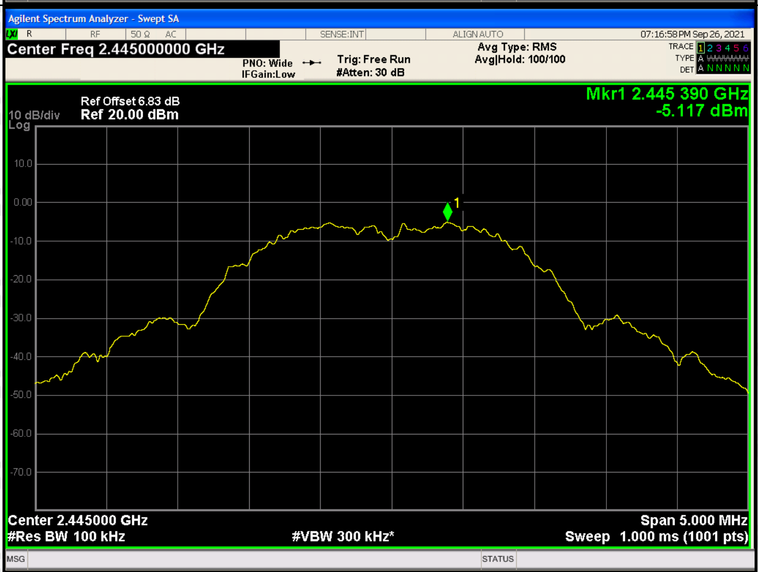
11.3 Test procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = RMS.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

11.4 Test Result

Mode	Channel.	Power Spectral Density (dBm/3KHz)	Limit(dBm/3KHz)	Verdict
O-QPSK	2405	-4.826	8	PASS
	2445	-5.117	8	PASS
	2480	-6.03	8	PASS

Test Graph

Graphs		
2405		
2445		
2480		

12. 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:

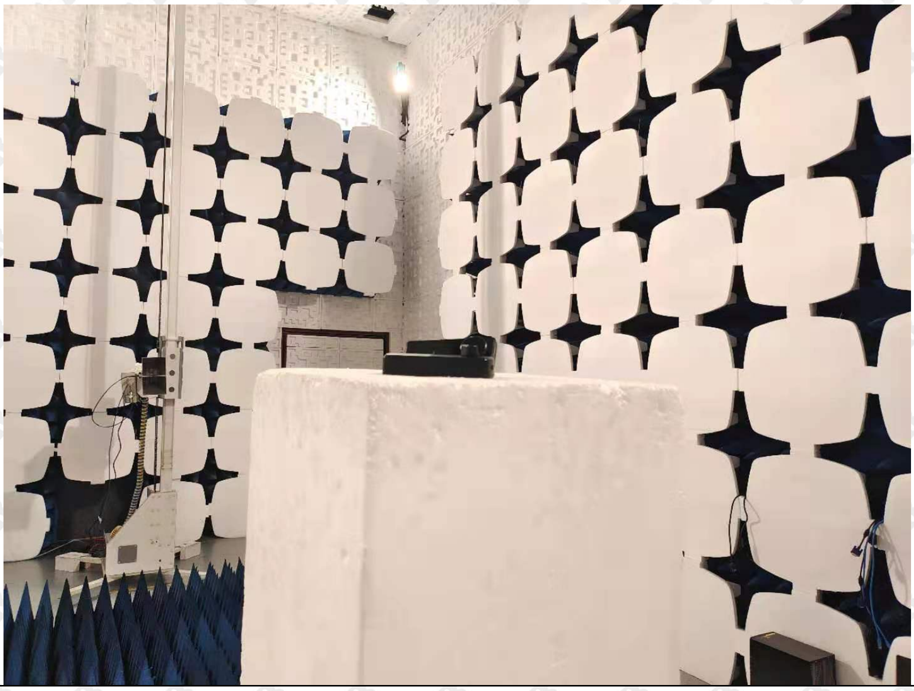
The antenna is External antenna. The best case gain of the antenna is 1dBi.

13. EUT TEST SETUP PHOTOGRAPHS

Radiated Emissions

Below 1G

Above 1G



Conducted Emission

※※※※※ END OF REPORT ※※※※※