



FCC TEST REPORT

FCC ID: QOBZBN4105

Product	:	Zigbee Plug In Switch Dual Control with Energy
Model Name	:	ZBN4105
Additional Models	:	85883,83239
Brand	:	JascoPro
Report No.	:	PTC26060921603E-FC01
Prepared for		
Jasco Products Company LLC		
10 e memorial road Office oklahoma city Oklahoma United States 73114		
Prepared by		
Precise Testing & Certification Co., Ltd		
Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China		



1 TEST RESULT CERTIFICATION

Applicant's name : Jasco Products Company LLC
Address : 10 e memorial road Office oklahoma city Oklahoma United States
73114
Manufacture's name : Ultra Tech Industries Company Limited
Address : NON SAO INDUSTRIAL CLUSTER, TAN DINH COMMUNE, Bac Ninh
Province, VIETNAM
Product name : Zigbee Plug In Switch Dual Control with Energy
Model name : ZBN4105
Additional Models : 85883,83239
Standards : FCC CFR47 Part 15 Section 15.247
Test procedure : ANSI C63.10-2020
Test Date : June 15, 2026 to August 04, 2026
Date of Issue : August 04, 2026
Test Result : Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

A handwritten signature in black ink, appearing to read 'Jack Zhou'.

Jack zhou / Engineer

Technical Manager:

A handwritten signature in black ink, appearing to read 'Simon Pu'.

Simon Pu / Manager



Contents

	Page
1 TEST RESULT CERTIFICATION	2
2 TEST SUMMARY	5
2.1 TEST SITE	6
3 GENERAL INFORMATION	7
3.1 GENERAL DESCRIPTION OF E.U.T.	7
3.2 CHANNEL LIST	8
4 EQUIPMENT DURING TEST	9
4.1 EQUIPMENTS LIST	9
4.2 MEASUREMENT UNCERTAINTY	11
4.3 DESCRIPTION OF SUPPORT UNITS	12
5 CONDUCTED EMISSION	13
5.1 E.U.T. OPERATION	13
5.2 EUT SETUP	13
5.3 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	14
5.4 MEASUREMENT PROCEDURE	14
5.5 CONDUCTED EMISSION LIMIT	14
5.6 MEASUREMENT RECEIVER PARAMETERS:	15
5.7 CONDUCTED EMISSION TEST RESULT	15
6 RADIATED SPURIOUS EMISSIONS	18
6.1 EUT OPERATION	18
6.2 TEST SETUP	19
6.3 SPECTRUM ANALYZER SETUP	20
6.4 TEST PROCEDURE	21
6.5 SUMMARY OF TEST RESULTS	23
7 CONDUCT BAND EDGE AND SPURIOUS EMISSIONS MEASUREMENT	30
7.1 TEST PROCEDURE	30
7.2 TEST SETUP	30
7.3 TEST RESULT	31
8 6DB BANDWIDTH MEASUREMENT	38
TEST PROCEDURE	38
TEST SETUP	38
TEST RESULT	38
9 MAXIMUM PEAK OUTPUT POWER	41
9.1 TEST PROCEDURE	41
9.2 TEST SETUP	41
9.3 TEST RESULT	41
10 POWER SPECTRAL DENSITY	44
10.1 TEST PROCEDURE	44
10.2 TEST SETUP	44
10.3 TEST RESULT	44
11 ANTENNA APPLICATION	47
11.1 ANTENNA REQUIREMENT	47
11.2 RESULT	47



Report No.: PTC26060921603E-FC01

12 TEST SETUP	48
13 EUT PHOTOS	50



2 Test Summary

Test Items	Test Requirement	Result
Conduct Emission	15.207	PASS
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
Conducted Spurious Emission	15.247(d)	PASS
Band edge	15.247(d) 15.205(a)	PASS
6dB Bandwidth	15.247(a)(2)	PASS
Maximum Peak Output Power	15.247(b)(3)	PASS
Power Spectral Density	15.247(e)	PASS
Antenna Requirement	15.203	PASS



Report No.: PTC26060921603E-FC01

2.1 Test Site

Precise Testing & Certification Co., Ltd

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A

FCC Designation Number: CN1219



3 General Information

3.1 General Description of E.U.T.

Product Name	:	Zigbee Plug In Switch Dual Control with Energy
Model name	:	ZBN4105
Additional Models	:	85883,83239
Models Difference	:	These models differ only in their names.
Specification	:	Zigbee
Operating frequency	:	2405-2480MHz
Modulation	:	O-QPSK For Zigbee
Number of Channel	:	16 channels For Zigbee
Antenna installation	:	PCB antenna
Antenna Gain	:	-2.92dBi
Power supply	:	Input:AC 125V 60Hz Output:AC 125V 15A
Hardware Version	:	N/A
Software Version	:	N/A



3.2 Channel List

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2020 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The details of test channels and bandwidth were for RF conductive measurement.

Channel List:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2405	6	2435	12	2465
1	2410	7	2440	13	2470
2	2415	8	2445	14	2475
3	2420	9	2450	15	2480
4	2425	10	2455		
5	2430	11	2460		
Note: $F_c = 2405 + 5(k - 11)$ in MHz, for $k = 11, 12, \dots, 26$.					

Test Frequency and channel for Zigbee:

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2405	7	2440	15	2480



4 Equipment During Test

4.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Last Calibration	Calibration Interval
MXG Signal Analyzer	Agilent	N9020A	SER MY5111038	10Hz-26.5GHz	Aug.14, 2025	1 Year
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Aug.14, 2025	1 Year
Power Meter	Anritsu	ML2495A	0949003	300MHz-40GHz	Aug.14, 2025	1 Year
Power Sensor	Anritsu	MA2411B	0917017	300MHz-40GHz	Aug.14, 2025	1 Year
DC power Supply	Agilent	E3642A	MY52420017	0-8V,5A/0-20 ,2.5A	Aug.14, 2025	1 Year
Test S/W	Tonscend	JS1120-3	/	/	/	/
6dB Attenuation	/	DC-3GHz	/	0.09MHz-3GHz	Aug.14, 2025	1 Year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Last Calibration	Calibration Interval
EMI Test Receiver	Rohde&Schwarz	ESPI7	101671	9KHz-7GHz	Aug.14, 2025	1 Year
Loop Antenna	Schwarzbeck	FMZB 1519	192	9 KHz -30MHz	Nov.27, 2025	1 Year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Sep.09, 2025	1 Year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	9KHz-1GHz	Mar.21, 2026	1 Year
Cable	IMRO	AK-9515E(9m)	Cable-L	9KHz-3GHz	Aug.14, 2025	1 Year
Spectrum	Rohde&Schwarz	FSV40	6625-01-588-55	9KHz-40GHz	Aug.14,	1 Year



Report No.: PTC26060921603E-FC01

Analyzer			15		2025	
Horn Antenna	SCHWARZBEC K	BBHA9120D	9120D-1246	1GHz-18GHz	Dec.11, 2025	1 Year
Power Amplifier	ZHINAN	ZN3380C	15002	1GHz-26.5GHz	Aug.14, 2025	1 Year
Horn Antenna	SCHWARZBEC K	BBHA 9170	9170-1066	15GHz-40GHz	Jun. 24, 2025	1 Year
Horn Antenna	SCHWARZBEC K	BBHA 9170	9170-1066	15GHz-40GHz	Jun. 11, 2026	1 Year
Amplifier	SCHWARZBEC K	BBV 9721	9721-205	18GHz-40GHz	Jun. 23, 2025	1 Year
Amplifier	SCHWARZBEC K	BBV 9721	9721-205	18GHz-40GHz	Jun. 08, 2026	1 Year
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Aug.14, 2025	1 Year
RF Cable	R&S	R204	R21X	1GHz-40GHz	Aug.14, 2025	1 Year
Test S/W	Tonscend	TS+	/	/	/	/

Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Date	Calibration Interval
EMI Test Receiver	Rohde&Schwarz	ESCI3	101417	9KHz-3GHz	Aug.14, 2025	1 Year
Artificial Mains Network	Rohde&Schwarz	ENV216	102453	9KHz-300MHz	Oct.29, 2025	1 Year
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Oct.29, 2025	1 Year
Limiter	R&S	ESH3-Z2	0357.8810.54-102808-N B	0Hz-30MHz	Aug.14, 2025	1 Year



RF Switch	DIAMOND ANTENNA	CX-210	/	0.09MHz-6GHz	Mar. 21,2026	1 Year
Test S/W	Tonscend	JS32-C E	/	/	/	/

4.2 Measurement Uncertainty

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

Parameter	Uncertainty
RF output power, conducted	±1.0dB
Power Spectral Density, conducted	±2.2dB
Radio Frequency	± 1 x 10 ⁻⁶
Bandwidth	± 1.5 x 10 ⁻⁶
Time	±2%
Duty Cycle	±2%
Temperature	±1°C
Humidity	±5%
DC and low frequency voltages	±3%
Conducted Emissions (150kHz~30MHz)	±3.64dB
Radiated Emission(9kHz~30MHz)	±3.15dB
Radiated Emission(30MHz~1GHz)	±5.03dB
Radiated Emission(1GHz~25GHz)	±4.74dB



Report No.: PTC26060921603E-FC01

4.3 Description of Support Units

Equipment	Model No.	Series No.
N/A	N/A	N/A

5 Conducted Emission

Test Requirement	: FCC CFR 47 Part 15 Section 15.207
Test Method	: ANSI C63.10-2020
Test Result	: PASS
Frequency Range	: 150kHz to 30MHz
Class/Severity	: Class B

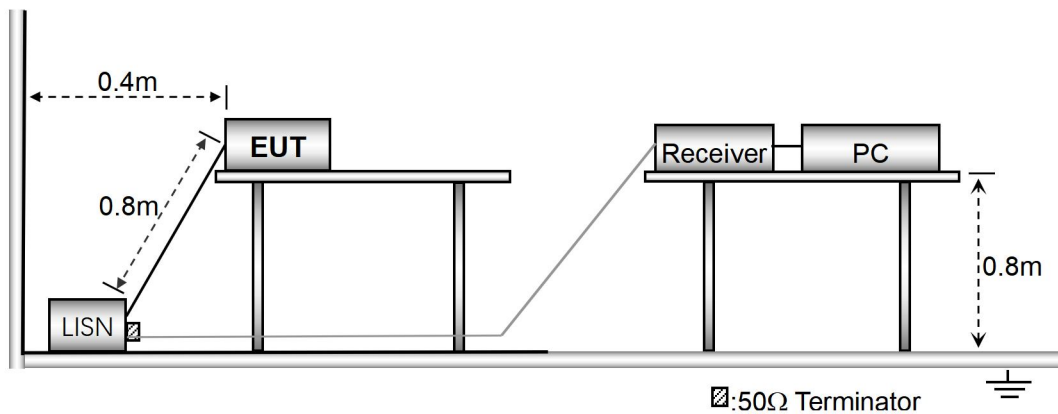
5.1 E.U.T. Operation

Operating Environment :

Temperature	: 25.5 °C
Humidity	: 51 % RH
Atmospheric Pressure	: 101.2kPa

5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10-2020.



5.3 Test SET-UP (Block Diagram of Configuration)



5.4 Measurement Procedure

1. Place the EUT on a non-conductive tabletop at a height of 80 cm. A vertical conductive shielding wall is located 40 cm behind the EUT.
2. The excess length of the power cord between the EUT and the LISN receptacle (or ac power receptacle where a LISN cannot be used), or an adapter or extension cord connected to and measured with the LISN shall be folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
3. EUT shall be placed at a distance of 80 cm from the LISN (or power receptacle where a LISN cannot be used) and connected thereto by a power lead or appropriate connection no more than 1 m long.
4. The equipment shall be arranged and installed in compliance with the standards, and operated in a manner that maximizes its emission characteristics in normal applications, with the six highest points on the waveform recorded.

5.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.



5.6 Measurement Receiver Parameters:

Receiver Parameters	Setting
Start Frequency	150kHz
Stop Frequency	30MHz
IF Bandwidth	9 kHz

5.7 Conducted Emission Test Result

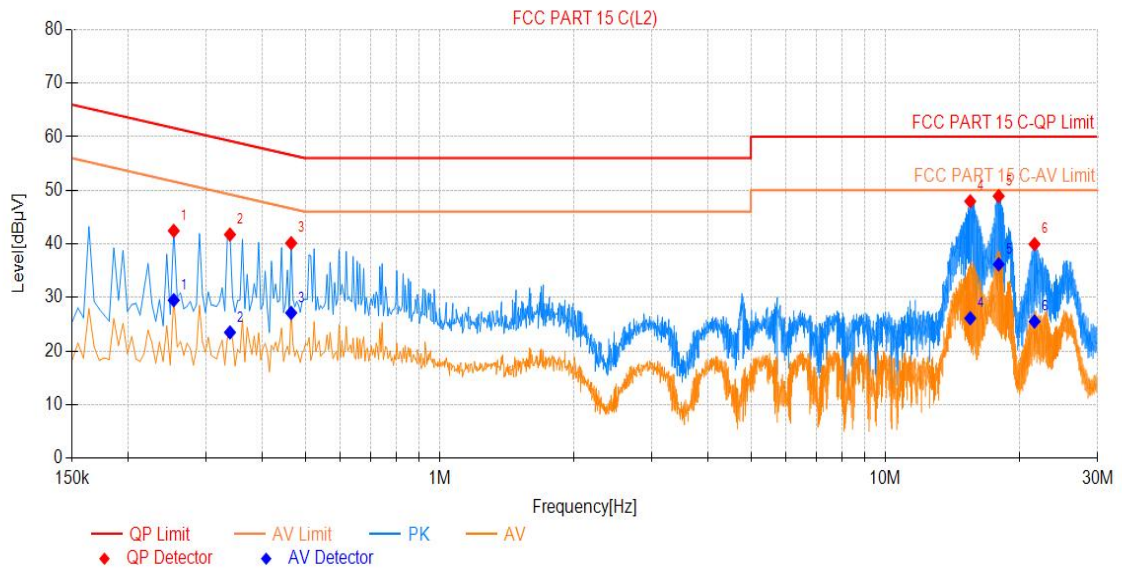
Pass.

All the modulation modes were tested the data of the worst mode, and it was found that (125Vac/60Hz, TX O-QPSK Low Channel) was a poor mode, and the report only reflected the poor mode.

Please refer to the following pages.



Line- AC 125V/60Hz

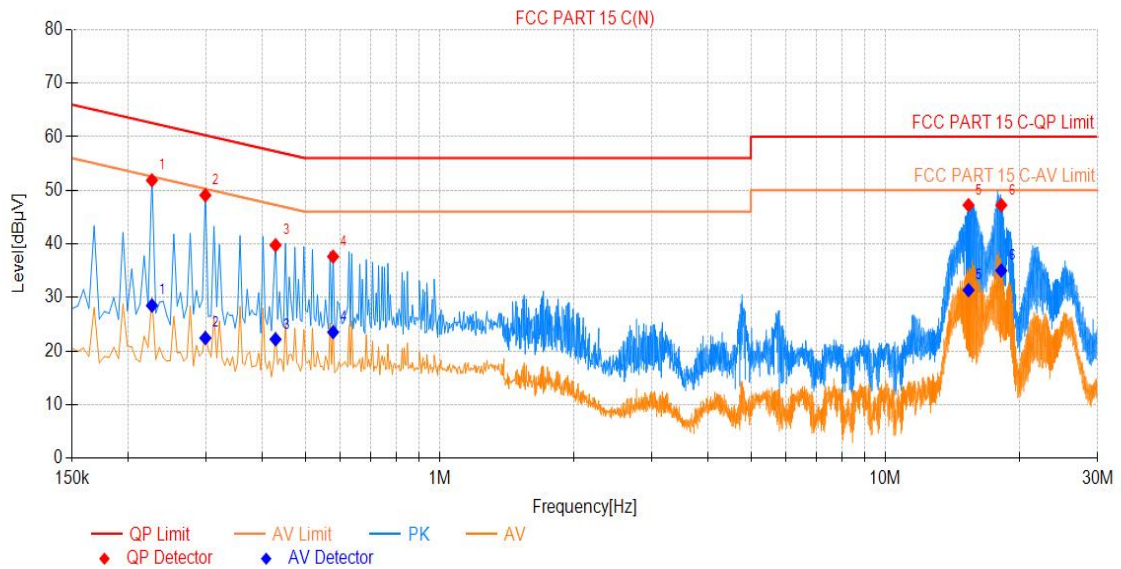


Final Data List

NO.	Freq. [MHz]	QP Reading [dBμV]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.254	32.46	9.98	42.44	61.64	19.20	19.50	29.48	51.64	22.16	PASS
2	0.339	31.76	9.98	41.74	59.23	17.49	13.48	23.46	49.23	25.77	PASS
3	0.465	30.16	9.98	40.14	56.60	16.46	17.13	27.11	46.60	19.49	PASS
4	15.536	37.52	10.43	47.95	60.00	12.05	15.68	26.11	50.00	23.89	PASS
5	17.997	38.43	10.49	48.92	60.00	11.08	25.70	36.19	50.00	13.81	PASS
6	21.656	29.38	10.58	39.96	60.00	20.04	14.92	25.50	50.00	24.50	PASS



Neutral-AC 125V/60Hz



Final Data List

NO.	Freq. [MHz]	QP Reading [dBμV]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Reading [dBμV]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Verdict
1	0.227	41.92	9.95	51.87	62.58	10.71	18.53	28.48	52.58	24.10	PASS
2	0.299	39.13	9.95	49.08	60.28	11.20	12.46	22.41	50.28	27.87	PASS
3	0.429	29.80	9.95	39.75	57.27	17.52	12.23	22.18	47.27	25.09	PASS
4	0.578	27.69	9.94	37.63	56.00	18.37	13.56	23.50	46.00	22.50	PASS
5	15.401	36.89	10.34	47.23	60.00	12.77	21.01	31.35	50.00	18.65	PASS
6	18.240	36.83	10.40	47.23	60.00	12.77	24.61	35.01	50.00	14.99	PASS

Note: QP Margin[dB]= QP Limit[dBμV]- QP Value[dBμV], AV Margin[dB]= AV Limit[dBμV]- AV Value[dBμV].



6 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247
 Test Method : ANSI C63.10-2020
 Test Result : PASS
 Measurement Distance : 3m
 Limit : See the follow table

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

6.1 EUT Operation

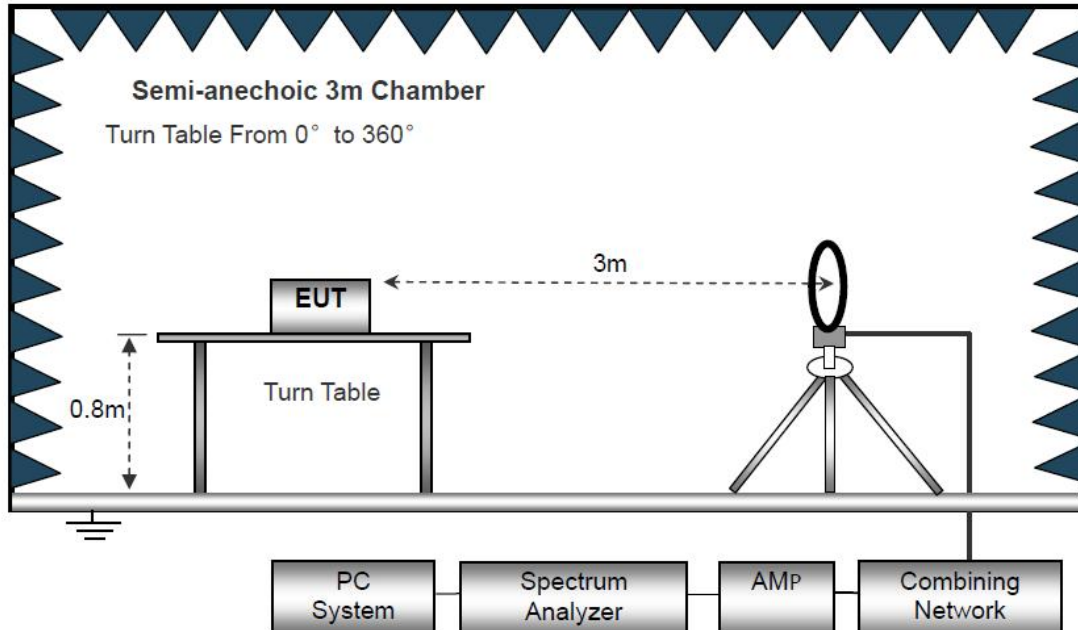
Operating Environment :

Temperature : 23.5 °C
 Humidity : 51.1 % RH
 Atmospheric Pressure : 101.2kPa

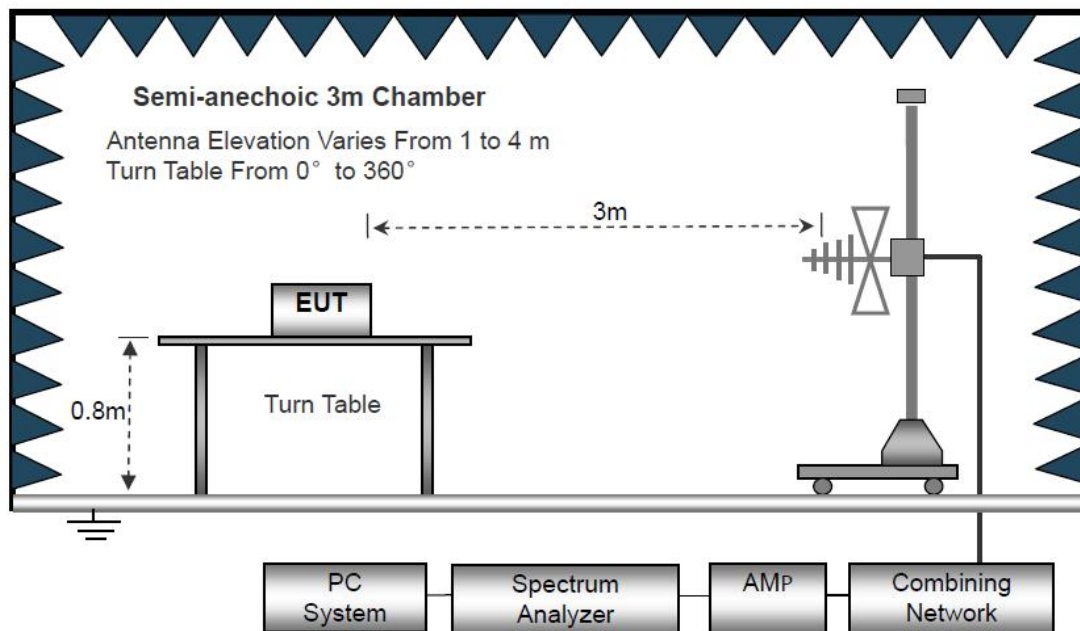
6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

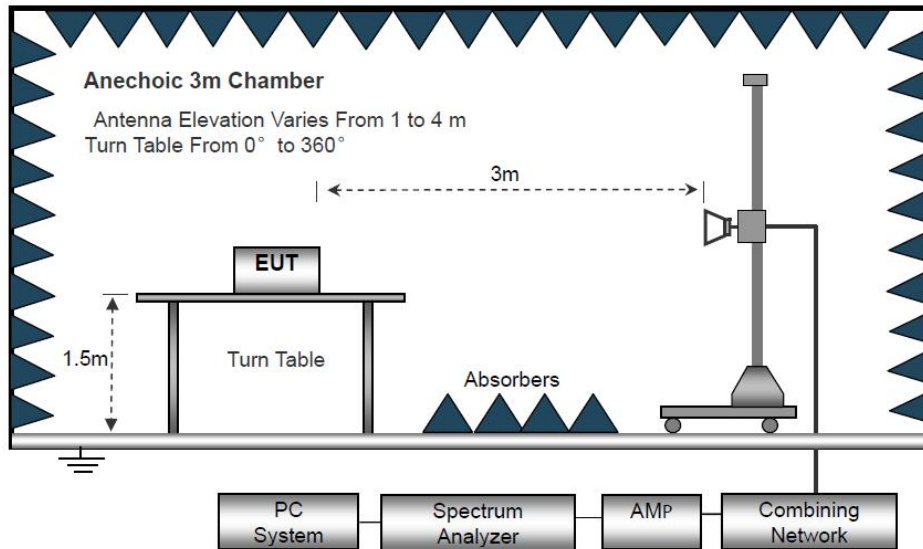
The test setup for emission measurement below 30MHz



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz



6.3 Spectrum Analyzer Setup

	Frequency	Detector	RBW	VBW	Remark
Receiver Setup	Below 30MHz	--	10kHz	10kHz	--
	30MHz ~ 1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value



6.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2020.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
7. Test Procedure of measurement (For Above 1GHz):
 - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
 - 2) Change the antenna polarization and repeat 1) with vertical polarization.
 - 3) Make a hardcopy of the spectrum.
 - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
 - 5) Change the analyser mode to Clear/ Write and found the cone of emission.
 - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.
 - 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
 - 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
8. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.



For Average Measurement:

VBW=10Hz, when duty cycle is no less than 98 percent.

VBW $\geq$ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

Band	Duty Cycle(%)	T(μ s)	1/T(KHz)	Average Correction Factor	VBW Setting
2405-2480	100	-	-	0	10Hz



6.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over Limit (dB)
--	--	--	--	>20

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance} / \text{test distance})$ (dB);

Limit line = Specific limits (dBuV) + distance extrapolation factor.

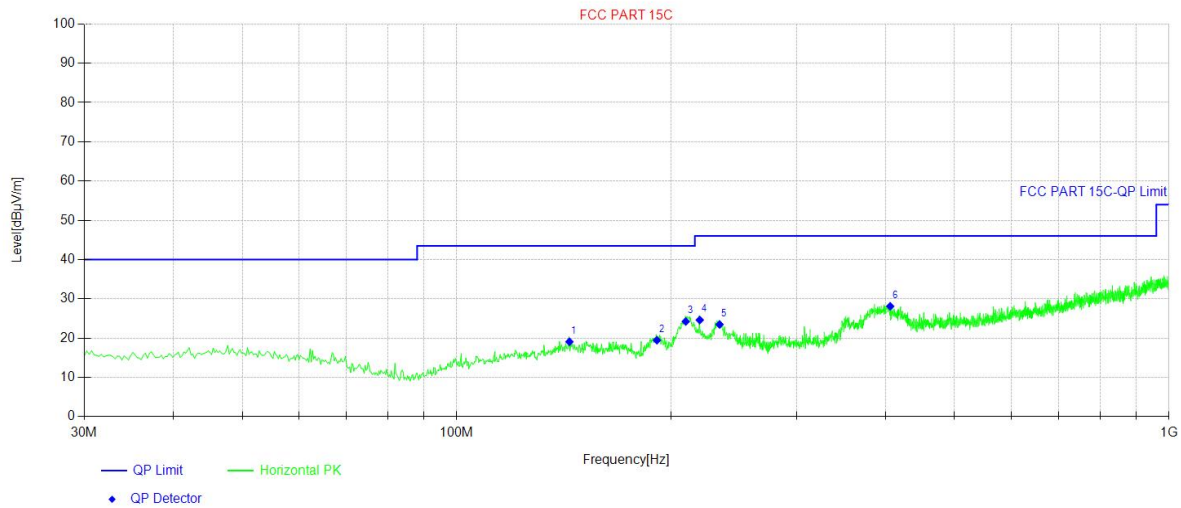
Test Frequency: 30MHz ~ 1GHz

Pass.

Please refer to the following test plots for the worst test mode (O-QPSK (CH00: 2405MHz)).



Antenna Polarization: Horizontal O-QPSK(CH00: 2405MHz)

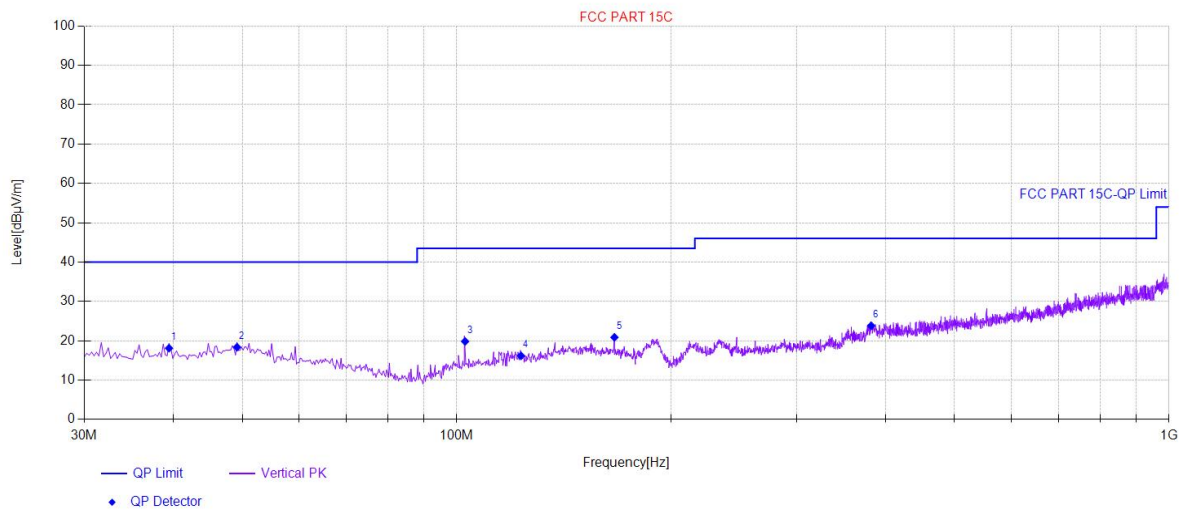


Final Data List[QP]								
NO.	Freq. [MHz]	QP Reading [dBμV/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Polarity	Verdict
1	143.98	27.35	-8.27	19.08	43.50	24.42	Horizontal	PASS
2	191.02	29.88	-10.41	19.47	43.50	24.03	Horizontal	PASS
3	209.69	34.82	-10.58	24.24	43.50	19.26	Horizontal	PASS
4	219.39	34.25	-9.64	24.61	46.00	21.39	Horizontal	PASS
5	233.94	32.22	-8.74	23.48	46.00	22.52	Horizontal	PASS
6	406.12	32.32	-4.22	28.10	46.00	17.90	Horizontal	PASS

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor



Antenna Polarization: Vertical O-QPSK(CH00: 2405MHz)



Final Data List[QP]								
NO.	Freq. [MHz]	QP Reading [dBμV/m]	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Polarity	Verdict
1	39.46	27.91	-9.79	18.12	40.00	21.88	Vertical	PASS
2	49.16	28.25	-9.87	18.38	40.00	21.62	Vertical	PASS
3	102.75	31.82	-11.98	19.84	43.50	23.66	Vertical	PASS
4	123.12	25.91	-9.73	16.18	43.50	27.32	Vertical	PASS
5	166.53	28.88	-8.01	20.87	43.50	22.63	Vertical	PASS
6	381.87	28.61	-4.78	23.83	46.00	22.17	Vertical	PASS

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor



Test Frequency 1GHz-25GHz:

Test Mode: CH00 O-QPSK					Test channel:Low Channel (2405MHz)			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4810	45.11	34.04	6.58	34.09	51.64	74	-22.36	V
7215	41.18	37.11	7.73	34.5	51.52	74	-22.48	V
9620	38.69	39.31	9.23	34.79	52.44	74	-21.56	V
4810	45.30	34.04	6.58	34.09	51.83	74	-22.17	H
7215	36.44	37.11	7.73	34.5	46.78	74	-27.22	H
9620	39.88	39.31	9.23	34.79	53.63	74	-20.37	H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4810	33.38	34.04	6.58	34.09	39.91	54	-14.09	V
7215	28.78	37.11	7.73	34.5	39.12	54	-14.88	V
9620	25.00	39.31	9.23	34.79	38.75	54	-15.25	V
4810	33.46	34.04	6.58	34.09	39.99	54	-14.01	H
7215	26.59	37.11	7.73	34.5	36.93	54	-17.07	H
9620	26.25	39.31	9.23	34.79	40.00	54	-14.00	H



Test Mode: CH07O-QPSK					Test channel:Middle Channel (2440MHz)			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4880	43.12	34.38	6.69	34.09	50.10	74	-23.90	V
7320	40.63	37.22	7.78	34.53	51.10	74	-22.90	V
9760	34.23	39.46	9.35	34.8	48.24	74	-25.76	V
4880	41.37	34.38	6.69	34.09	48.35	74	-25.65	H
7320	37.77	37.22	7.78	34.53	48.24	74	-25.76	H
9760	37.70	39.46	9.35	34.8	51.71	74	-22.29	H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4880	34.43	34.38	6.69	34.09	41.41	54	-12.59	V
7320	28.75	37.22	7.78	34.53	39.22	54	-14.78	V
9760	24.60	39.46	9.35	34.8	38.61	54	-15.39	V
4880	34.22	34.38	6.69	34.09	41.20	54	-12.80	H
7320	27.20	37.22	7.78	34.53	37.67	54	-16.33	H
9760	26.02	39.46	9.35	34.8	40.03	54	-13.97	H



Test Mode: CH15 O-QPSK					Test channel:High Channel (2480MHz)			
Peak Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4960	41.63	34.72	6.79	34.09	49.05	74	-24.95	V
7440	40.03	37.34	7.82	34.57	50.62	74	-23.38	V
9920	34.23	39.62	9.46	34.81	48.50	74	-25.50	V
4960	40.55	34.72	6.79	34.09	47.97	74	-26.03	H
7440	37.80	37.34	7.82	34.57	48.39	74	-25.61	H
9920	37.74	39.62	9.46	34.81	52.01	74	-21.99	H
Average Value								
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.
4960	33.99	34.72	6.79	34.09	41.41	54	-12.59	V
7440	27.79	37.34	7.82	34.57	38.38	54	-15.62	V
9920	25.98	39.62	9.46	34.81	40.25	54	-13.75	V
4960	32.44	34.72	6.79	34.09	39.86	54	-14.14	H
7440	28.39	37.34	7.82	34.57	38.98	54	-15.02	H
9920	26.23	39.62	9.46	34.81	40.50	54	-13.50	H

Note: 1. The testing has been conformed to 10*2480MHz=24800MHz.

2. All other emissions more than 30dB below the limit.
3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Reading + Factor
Margin=Emission Level-Limit



Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

Test Mode: Low Channel 2405MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2310	55.52	28.67	6.72	37.26	53.65	74	-20.35	H	Peak
2390	54.48	28.08	6.81	37.12	52.25	74	-21.75	H	Peak
2310	32.57	28.67	6.72	37.26	30.70	54	-23.30	H	Average
2390	33.35	28.08	6.81	37.12	31.12	54	-22.88	H	Average
2310	55.10	28.67	6.72	37.26	53.23	74	-20.77	V	Peak
2390	56.79	28.08	6.81	37.12	54.56	74	-19.44	V	Peak
2310	37.15	28.67	6.72	37.26	35.28	54	-18.72	V	Average
2390	35.20	28.08	6.81	37.12	32.97	54	-21.03	V	Average

Test Mode: High Channel 2480MHz									
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over (dB)	Polarity H/V	Test Value
2483.5	54.05	27.38	6.15	36.29	51.29	74	-22.71	H	Peak
2500	54.06	27.43	6.68	36.79	51.38	74	-22.62	H	Peak
2483.5	35.37	27.38	6.15	36.29	32.61	54	-21.39	H	Average
2500	36.91	27.43	6.68	36.79	34.23	54	-19.77	H	Average
2483.5	54.61	27.38	6.15	36.29	51.85	74	-22.15	V	Peak
2500	54.74	27.43	6.68	36.79	52.06	74	-21.94	V	Peak
2483.5	36.97	27.38	6.15	36.29	34.21	54	-19.79	V	Average
2500	37.98	27.43	6.68	36.79	35.30	54	-18.70	V	Average



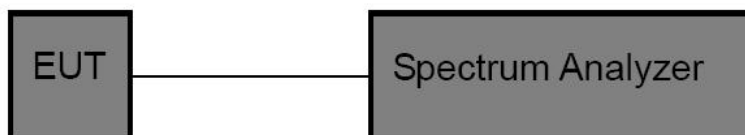
7 Conduct Band Edge And Spurious Emissions Measurement

Test Requirement	: Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method	: ANSI C63.10-2020
Test Limit	: Regulation 15.247 (d),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)).

7.1 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 = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

7.2 Test Setup





7.3 Test Result

TestMode	Antenna	Frequency[MHz]	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
ZIGB	Ant1	2405	0~Reference	-1.09	-1.09	---	PASS
ZIGB	Ant1	2405	30~1000	-1.09	-40.64	≤ -21.09	PASS
ZIGB	Ant1	2405	1000~26500	-1.09	-41.55	≤ -21.09	PASS
ZIGB	Ant1	2440	0~Reference	0.15	0.15	---	PASS
ZIGB	Ant1	2440	30~1000	0.15	-40.45	≤ -19.85	PASS
ZIGB	Ant1	2440	1000~26500	0.15	-42.12	≤ -19.85	PASS
ZIGB	Ant1	2480	0~Reference	-0.03	-0.03	---	PASS
ZIGB	Ant1	2480	30~1000	-0.03	-54.17	≤ -20.03	PASS
ZIGB	Ant1	2480	1000~26500	-0.03	-42.37	≤ -20.03	PASS



Test Graphs:

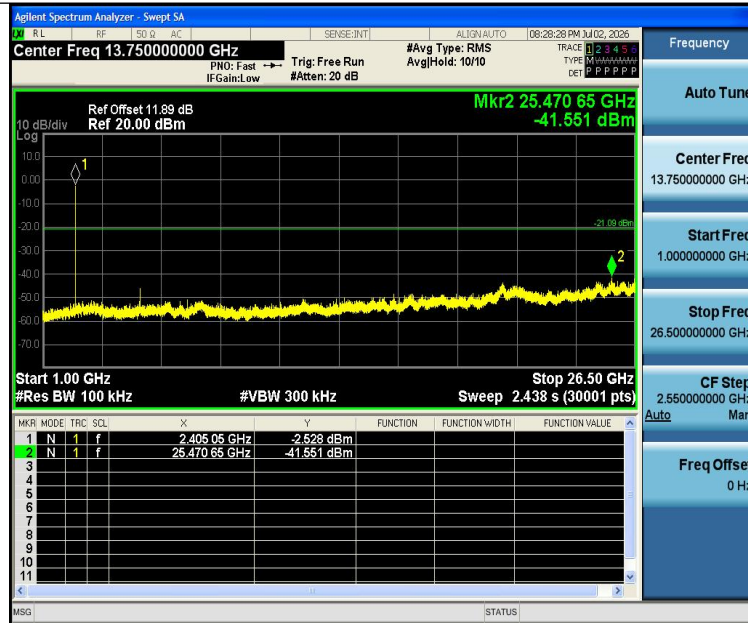
ZIGB-Ant1-2405-0~Reference-PASS



ZIGB-Ant1-2405-30~1000-PASS



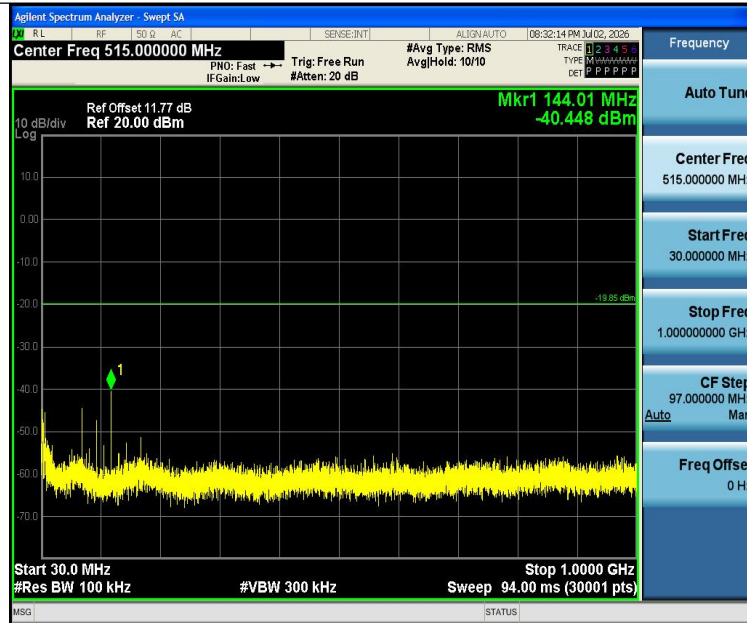
ZIGB-Ant1-2405-1000~26500-PASS



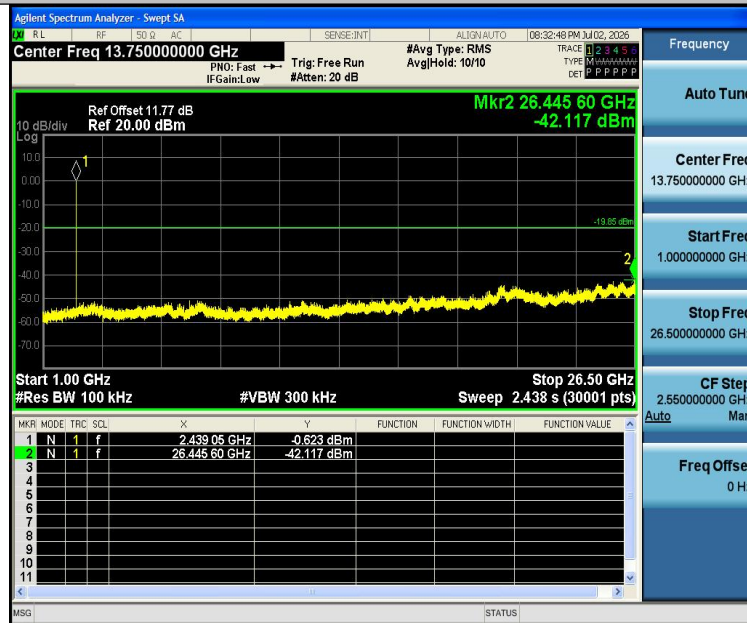
ZIGB-Ant1-2440-0~Reference-PASS



ZIGB-Ant1-2440-30~1000-PASS



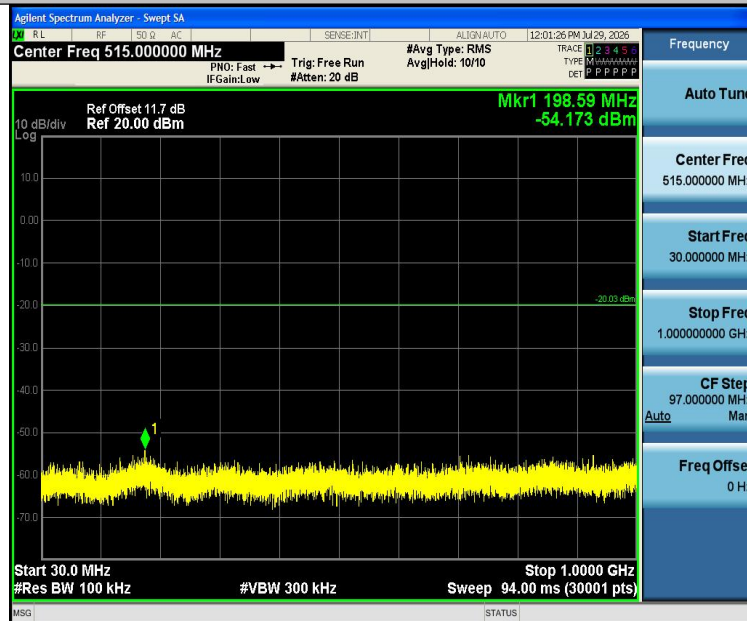
ZIGB-Ant1-2440-1000~26500-PASS



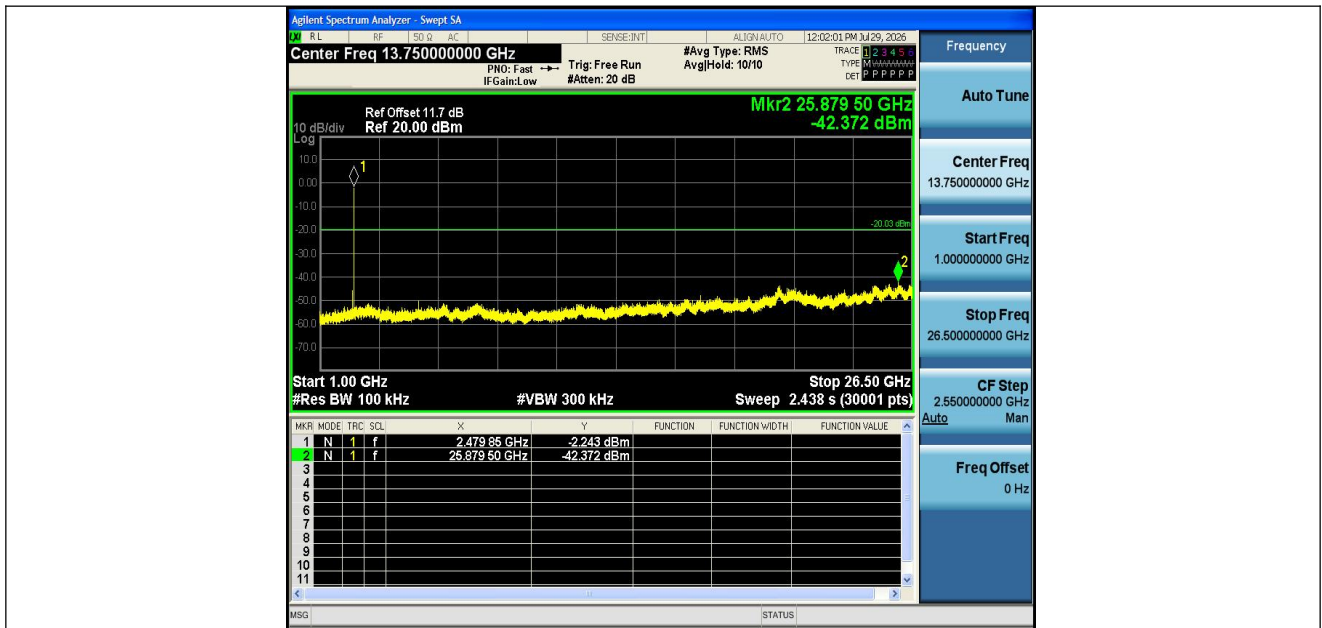
ZIGB-Ant1-2480-0~Reference-PASS



ZIGB-Ant1-2480-30~1000-PASS



ZIGB-Ant1-2480-1000~26500-PASS

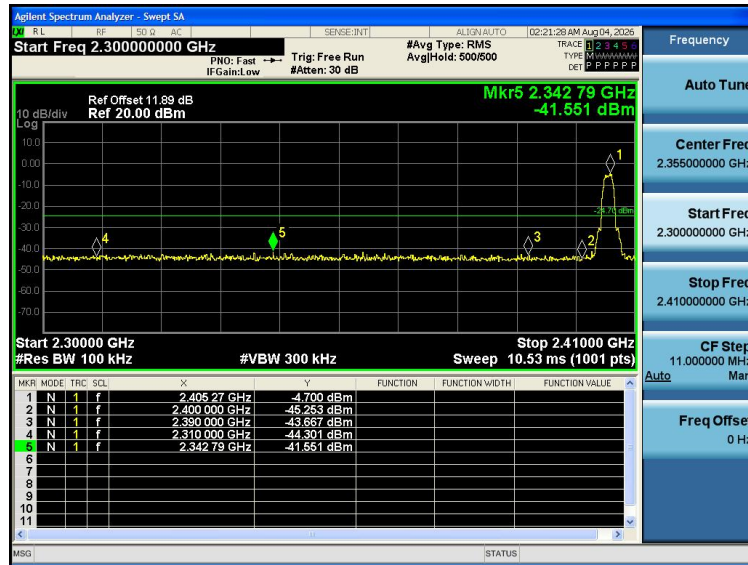




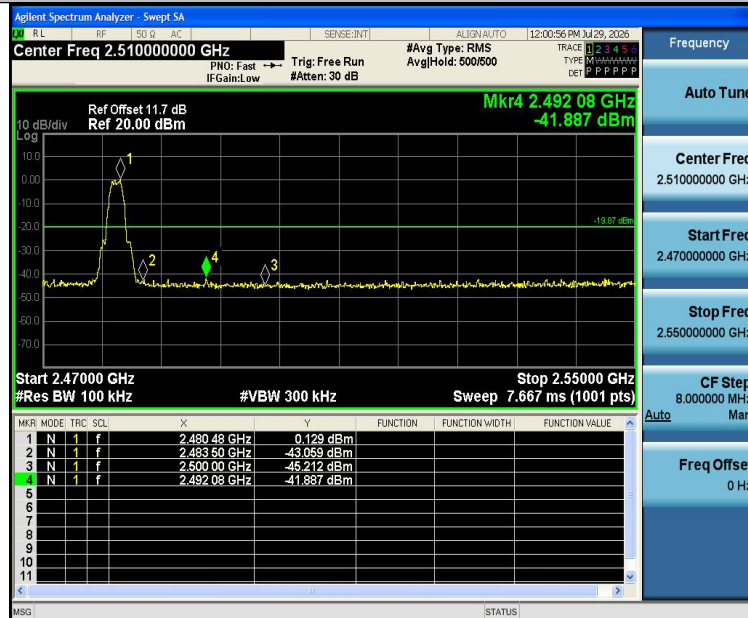
Band edge:

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
ZIGB	Ant1	Low	2405	-4.70	-41.55	≤-24.70	PASS
ZIGB	Ant1	High	2480	0.13	-41.89	≤-19.87	PASS

ZIGB-Ant1-2405-PASS



ZIGB-Ant1-2480-PASS





8 6dB Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.247

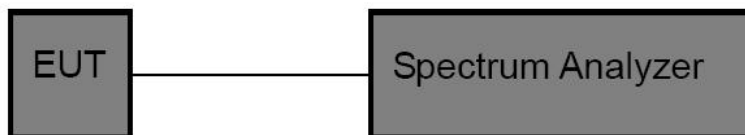
Test Method : ANSI C63.10-2020

Test Limit : Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

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 = 100kHz, VBW = 300kHz

Test Setup



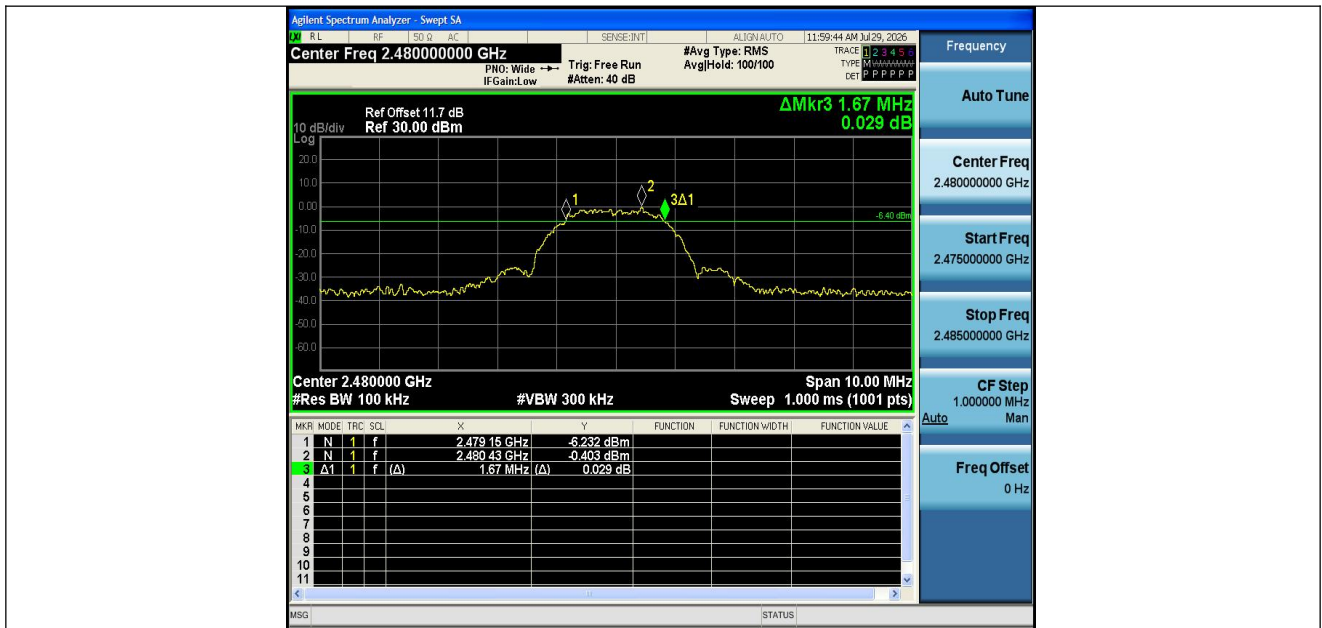
Test Result

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
ZIGB	Ant1	2405	1.700	2404.130	2405.830	0.5	PASS
ZIGB	Ant1	2440	1.730	2439.100	2440.830	0.5	PASS
ZIGB	Ant1	2480	1.670	2479.150	2480.820	0.5	PASS



Test Graphs:







9 Maximum Peak Output Power

Test Requirement : FCC CFR47 Part 15 Section 15.247

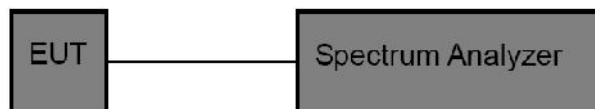
Test Method : ANSI C63.10-2020

Test Limit : Regulation 15.247 (b)(3), For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

9.1 Test Procedure

1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Measure the conducted output power and record the results in the test report.

9.2 Test Setup



9.3 Test Result

TestMode	Antenna	Frequency[MHz]	Result[dBm]	Limit[dBm]	Verdict
ZIGB	Ant1	2405	3.05	≤30	PASS
ZIGB	Ant1	2440	4.31	≤30	PASS
ZIGB	Ant1	2480	4.33	≤30	PASS

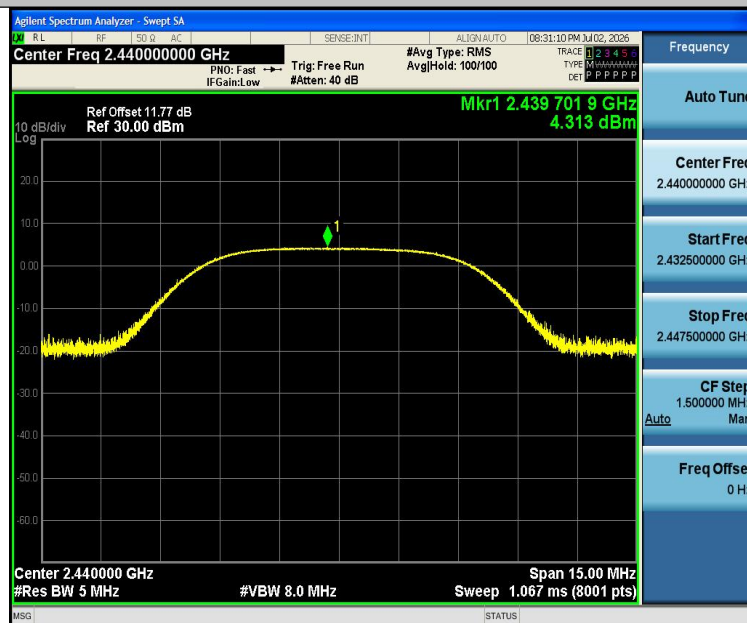


Test Graphs:

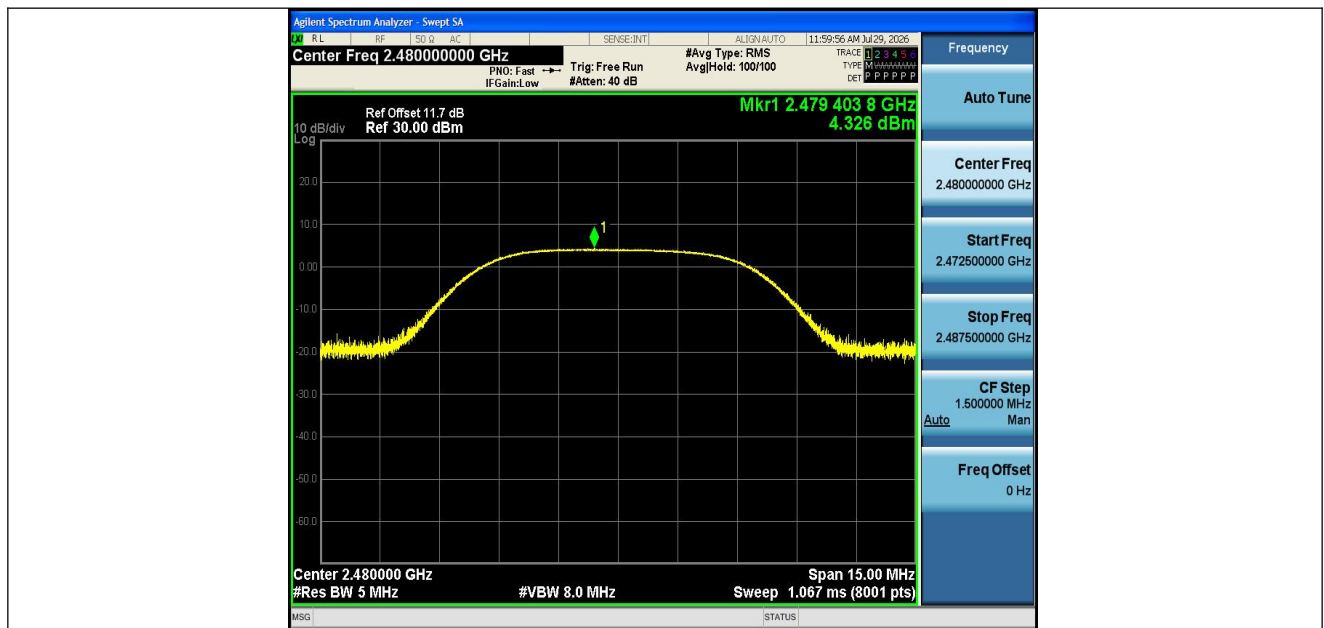
ZIGB-Ant1-2405-PASS



ZIGB-Ant1-2440-PASS



ZIGB-Ant1-2480-PASS





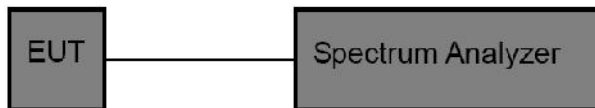
10 Power Spectral density

Test Requirement	: FCC CFR47 Part 15 Section 15.247
Test Method	: ANSI C63.10-2020
Test Limit	: Regulation 15.247(f) The power spectral density conducted from the intentional radiator to the antenna due to the digital modulation operation of the hybrid system, with the frequency hopping operation turned off, shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

10.1 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 = 3kHz. VBW = 10kHz , Span = 1.5 times the DTS channel bandwidth(6 dB bandwidth). Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

10.2 Test Setup



10.3 Test Result

TestMode	Antenna	Frequency[MHz]	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
ZIGB	Ant1	2405	-12.65	≤8.00	PASS
ZIGB	Ant1	2440	-11.41	≤8.00	PASS
ZIGB	Ant1	2480	-11.48	≤8.00	PASS



Test Graphs:

ZIGB-Ant1-2405-PASS



ZIGB-Ant1-2440-PASS



ZIGB-Ant1-2480-PASS





11 Antenna Application

11.1 Antenna Requirement

For intentional device, according to FCC 47 CFR Section 15.203, 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

11.2 Result

The EUT'S antenna, permanent attached antenna, is internal PCB antenna. The antenna's gain is -2.92dBi and meets the requirement.

12 Test Setup

Conducted Spurious Emissions



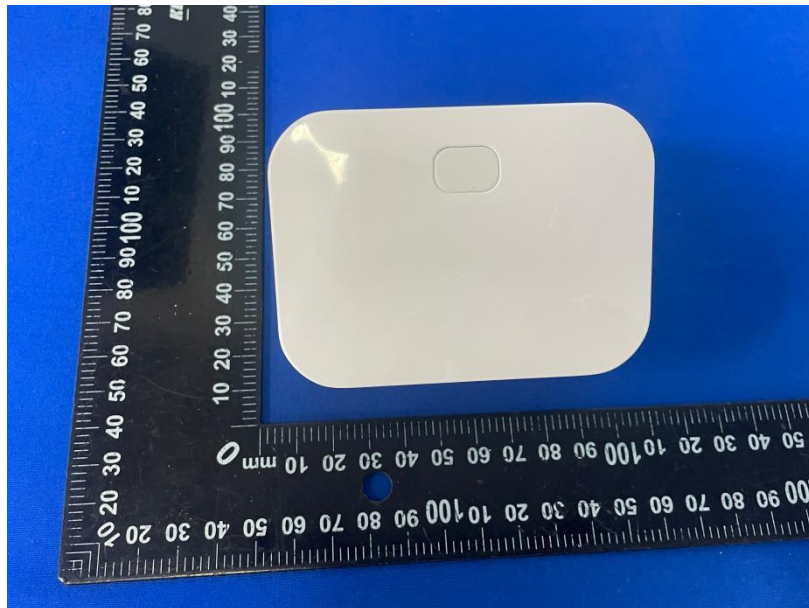
Radiated Spurious Emissions
Test Frequency From 30MHz-1GHz

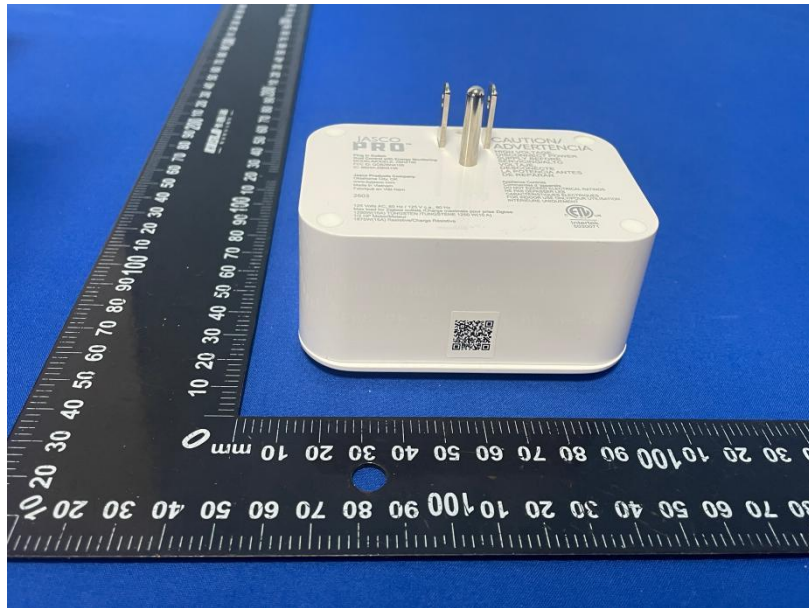


Test frequency from Above 1GHz



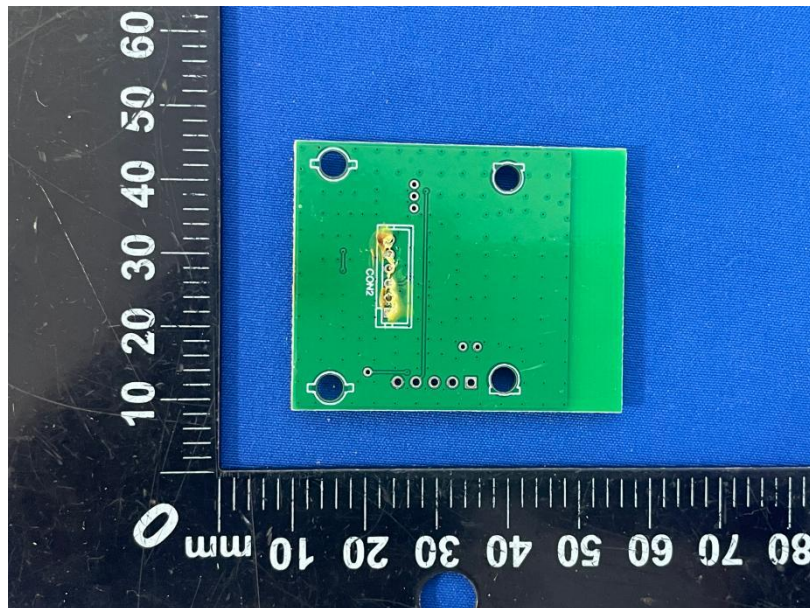
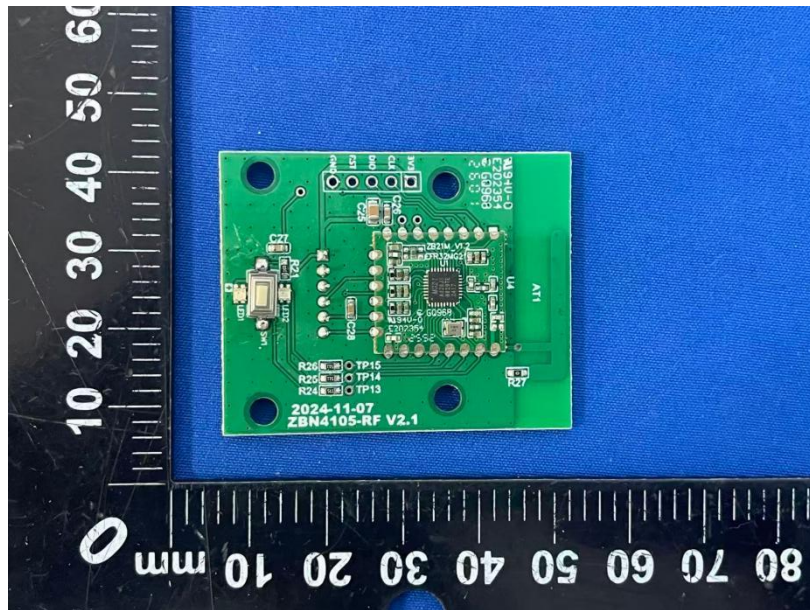
13 EUT Photos

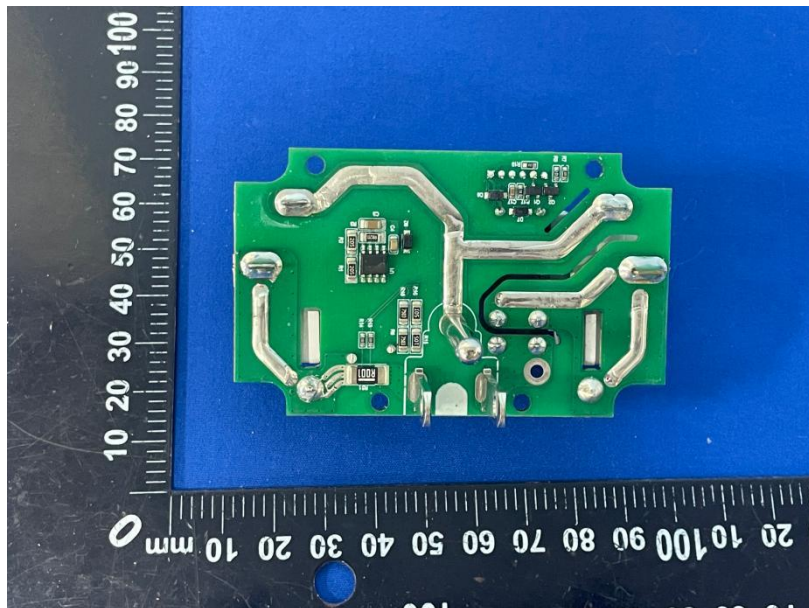
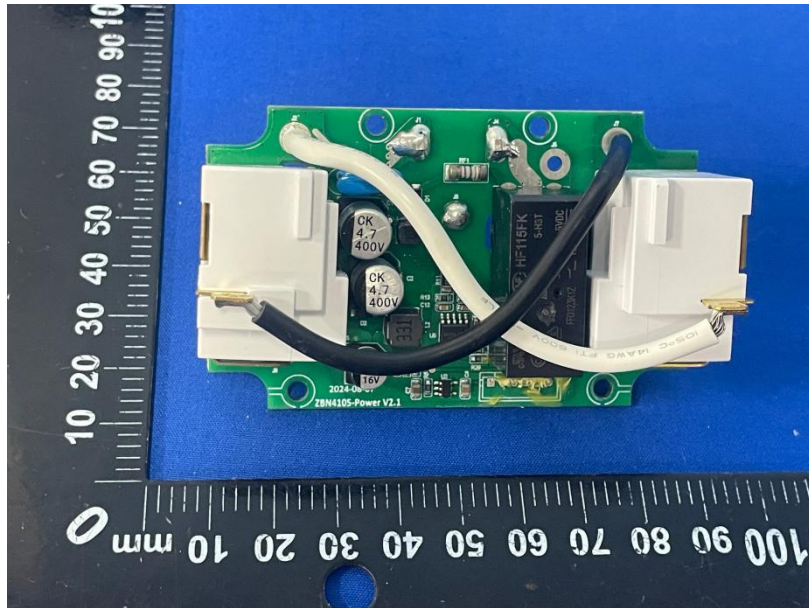












*****THE END REPORT*****