IKEA of Sweden AB

RF TEST REPORT

Report Type:
FCC Part 15.247 RF report

Model:
E2202

REPORT NUMBER:
230601014SHA-001

ISSUE DATE:
November 8, 2023

DOCUMENT CONTROL NUMBER:
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Report no.: 230601014SHA-001

Applicant	:	IKEA of Sweden AB Box 702 SE-343 81 Älmhult, SWEDEN
Manufacturing	:	IKEA of Sweden AB Box 702 SE-343 81 Älmhult, SWEDEN
Manufacturing site	:	Haysonic IoT Technology Co., Ltd Xingtai Industrial Park, Economic Development Zone Changtai County, Zhangzhou City, Fujian Province, China
Product Name	:	BADRING water leakage sensor
Type/Model	:	E2202
FCC ID	:	FHO- E2202

SUMMARY:

Referring to the emission limits, and the operating mode during the tests specified in this report, the equipment complies with the requirements according to following standards:

47CFR Part 15 (2021): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:	**REVIEWED BY:**
Project Engineer Dylan Tang	Reviewer Wakeyou Wang

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Revision History

Report No.	Version	Description	Issued Date
230601014SHA-001	Rev. 01	Initial issue of report	August 29, 2023
230601014SHA-001	Rev. 02	Updated report	November 8, 2023

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Measurement result summary

TEST ITEM	FCC REFERENCE	RESULT
Minimum 6dB Bandwidth	15.247(a)(2)	Pass
Maximum conducted output power and e.i.r.p.	15.247(b)(3)	Pass
Power spectrum density	15.247(e)	Pass
Emission outside the frequency band	15.247(d)	Pass
Radiated Emissions in restricted frequency bands	15.247(d), 15.205&15.209	Pass
Antenna requirement	15.203	Pass

Notes: 1: NA =Not Applicable

2. Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

TEST REPORT

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	BADRING water leakage sensor
Type/Model:	E2202
Description of EUT:	The EUT is a water leakage sensor intended for indoor use that supports Zigbee radio technology, it has only one model.
Rating:	DC 3V
EUT type:	☒ Table top ☐ Floor standing
Software Version:	P1.1
Hardware Version:	V2.4.1
Sample received date:	June 27, 2023
Date of test:	June 28, 2023~October 16, 2023

1.2 Technical Specification

Frequency Range:	2405-2480MHz
Type of Modulation:	O-QPSK
Channel Number:	16
Channel Separation:	5MHz

1.3 Antenna information

No.	Antenna Type	Gain	Note
1	PCB Antenna	3.71dBi	On Board type

1.4 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2021)
ANSI C63.10 (2013)
KDB 558074 (v05r02)

2.2 Mode of operation during the test

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

Software name	Manufacturer	Version	Supplied by
UartAssist	-	V3.8	Client

The lowest, middle and highest channel were tested as representatives.
The channels were tested as representatives.

Frequency Band (MHz)				2405 ~ 2480			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
11	**2405**	15	2425	**19**	**2445**	23	2465
12	2410	16	2430	20	2450	24	2470
13	2415	17	2435	21	2455	25	2475
14	2420	18	2440	22	2460	**26**	**2480**

Data rate VS Power:
The test setting software is offered by the manufactory. The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

Test software and Power Setting parameter			
Working Mode	Continuously transmission		
Test Channel	2405MHz	2445MHz	2480MHz
Power Setting	3	3	3

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
1	Laptop computer	DELL 5480	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Minimum 6dB Bandwidth	18°C	51%RH
Maximum conducted output power and e.i.r.p.		
Power spectrum density		
Emission outside the frequency band		
Occupied bandwidth		
Radiated Emissions in restricted frequency bands	19°C	52%RH

2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
☐	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
☐	A.M.N.	R&S	ENV4200	EC 3558	2024-06-05
☐	Attenuator	Hua Xiang	Ts5-10db-6g	EC 6194-1	2023-12-07
☐	Shielded room	Zhongyu	-	EC 2838	2024-01-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-24
☑	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2024-08-23
☐	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC 5262	2024-06-15
☑	Pre-amplifier	Tonscend	TAP01018050	EC 6432-1	2023-12-07
☑	Horn antenna	Tonscend	BBHA9120D	EC 6432-2	2024-02-15
☑	Horn antenna	ETS	3116c	EC 5955	2024-06-16
☑	Semi-anechoic chamber	Albatross project	-	EC 3048	2023-07-08
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2024-03-05
☐	PXA Signal Analyzer	Keysight	N9030B	EC 6078	2024-06-15
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2024-03-05
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2024-03-05
☐	Test Receiver	R&S	ESCI 7	EC 4501	2024-03-05
☐	Universal Radio Communication Tester	R&S	CMW500	EC 6209	2024-01-30
☐	Universal Radio Communication Tester	R&S	CMW500	EC5944	2024-03-05
☐	Signal generator	Agilent	N5182A	EC 6172	2024-08-08
☐	Signal generator	Agilent	N5181A	EC 6171	2024-08-08
☑	Climate chamber	GWS	MT3065	EC 6021	2024-03-06
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2024-03-24
☑	Pressure meter	YM3	Shanghai Mengde	EC 3320	2024-08-16

2.7 Measurement uncertainty

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

Test item	Measurement uncertainty
Maximum peak output power	± 0.74dB
Minimum 6dB bandwidth	
Power spectrum density	
Emission outside the frequency band	
Occupied bandwidth	
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

3 Minimum 6dB bandwidth

Test result: Pass

3.1 Limit

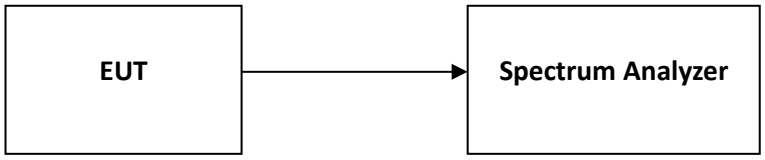
For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

3.2 Measurement Procedure

The EUT was tested according to Subclause 11.8 of ANSI C63.10.

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3 × RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

3.3 Test Configuration



3.4 Test Results of Minimum 6dB bandwidth

Please refer to Appendix I

4 Maximum conducted output power and e.i.r.p.

Test result: Pass

4.1 Limit

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 W. (The e.i.r.p. shall not exceed 4 W)

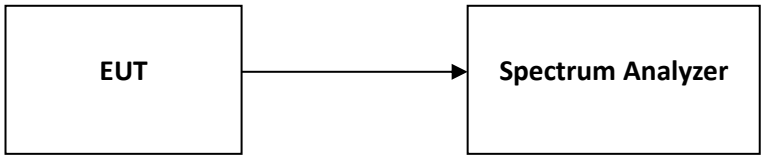
If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beam forming gain).

4.2 Measurement Procedure

The EUT was tested according to Subclause 11.9.2.2 of ANSI C63.10.

a) Measure the duty cycle, x, of the transmitter output signal as described in Section 6.0.
b) Set span to at least 1.5 x OBW.
c) Set RBW = 1 % to 5 % of the OBW, not to exceed 1 MHz.
d) Set VBW ≥ 3 x RBW.
e) Number of points in sweep ≥ 2 x span / RBW. (This gives bin-to-bin spacing ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
f) Sweep time = auto.
g) Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
h) Do not use sweep triggering. Allow the sweep to “free run”.
i) Trace average at least 100 traces in power averaging (i.e., RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the on and off periods of the transmitter.
j) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
k) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on- and off-times of the transmission). For example, add 10 log (1/0.25) = 6 dB if the duty cycle is 25 %.

4.3 Test Configuration



4.4 Test Results of Maximum conducted output power

Please refer to Appendix I

5 Power spectrum density

Test result: **Pass**

5.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beam forming type, the limit should be the minimum of 8dBm/MHz and 8+ (6 –antenna gain-beam forming gain).

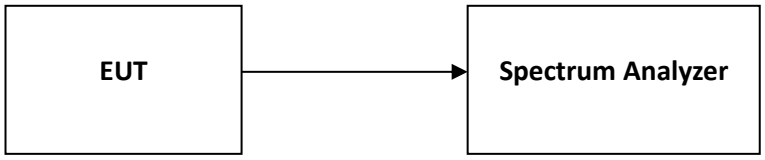
5.2 Measurement Procedure

The EUT was tested according to Subclause 11.10 of ANSI C63.10.

This procedure is applicable when the EUT cannot be configured to transmit continuously (i.e., duty cycle < 98 %), and when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (i.e., duty cycle variations are less than ± 2 %):

a) Measure the duty cycle (x) of the transmitter output signal as described in Section 6.0.
b) Set instrument center frequency to DTS channel center frequency.
c) Set span to at least 1.5 x OBW.
d) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
e) Set VBW ≥3 x RBW.
f) Detector = power averaging (RMS) or sample detector (when RMS not available).
g) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
h) Sweep time = auto couple.
i) Do not use sweep triggering. Allow sweep to “free run”.
j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
k) Use the peak marker function to determine the maximum amplitude level.
l) Add 10 log (1/x), where x is the duty cycle measured in step (a, to the measured PSD to compute the average PSD during the actual transmission time.
m) If resultant value exceeds the limit, then reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

5.3 Test Configuration



5.4 Test Results of Power spectrum density

Please refer to Appendix I

6 Emission outside the frequency band

Test result: **Pass**

6.1 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.

6.2 Measurement Procedure

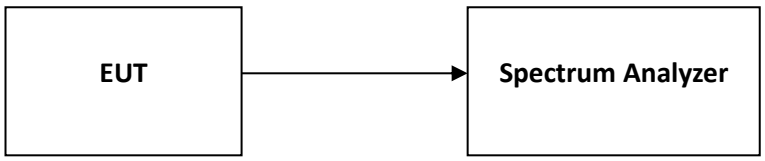
The EUT was tested according to Subclause 11.11 of ANSI C63.10.

Reference level measurement
Establish a reference level by using the following procedure:
a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

Emission level measurement
a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ 3 x RBW.
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

6.3 Test Configuration



6.4 The results of Emission outside the frequency band

Please refer to Appendix I

7 Radiated Emissions in restricted frequency bands

Test result: **Pass**

7.1 Limit

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

7.2 Measurement Procedure

The EUT was tested according to Subclause 11.12 of ANSI C63.10.

For Radiated emission below 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. 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) Both X and Y axes of the antenna are set to make the measurement.
d) For each suspected emission, the EUT was arranged to its worst case 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 Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

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For Radiated emission above 30MHz:

a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meters chamber room for test. 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 height of antenna 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 quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

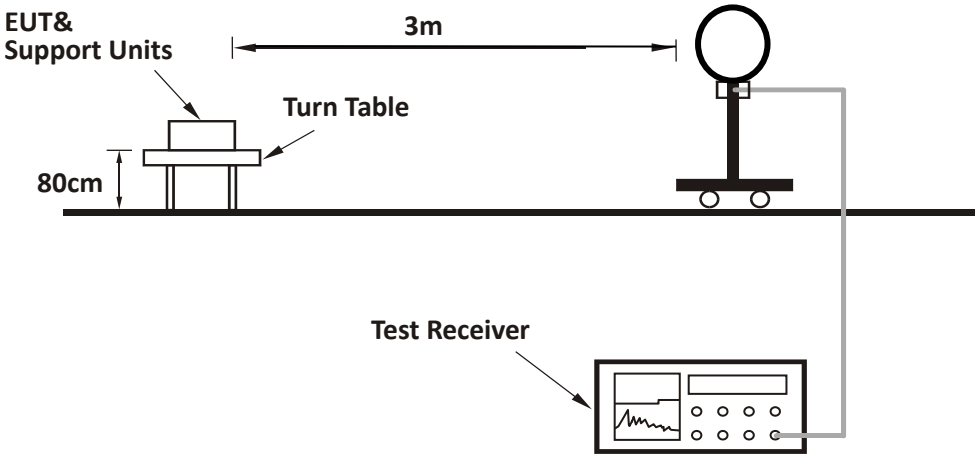
f) The test-receiver system was set to peak and average detector function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

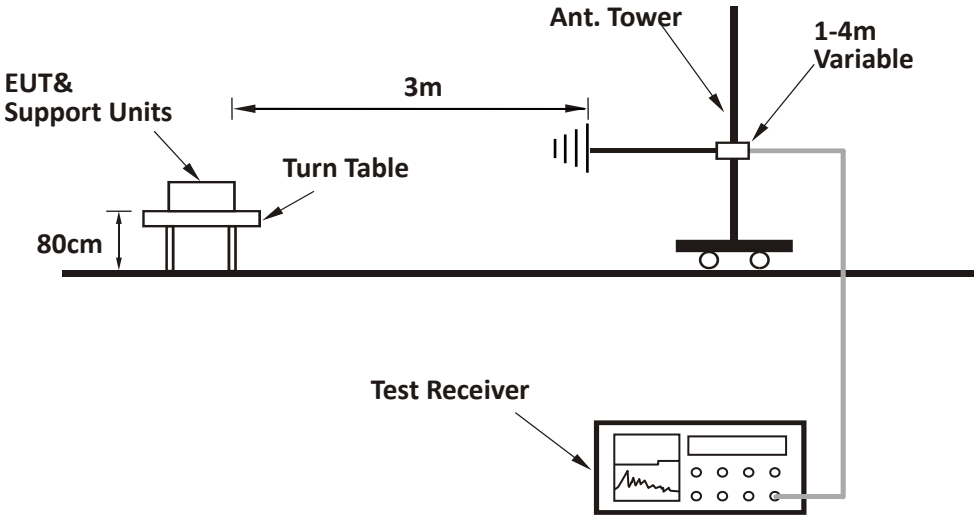
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 98%) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions were reported.

7.3 Test Configuration

For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



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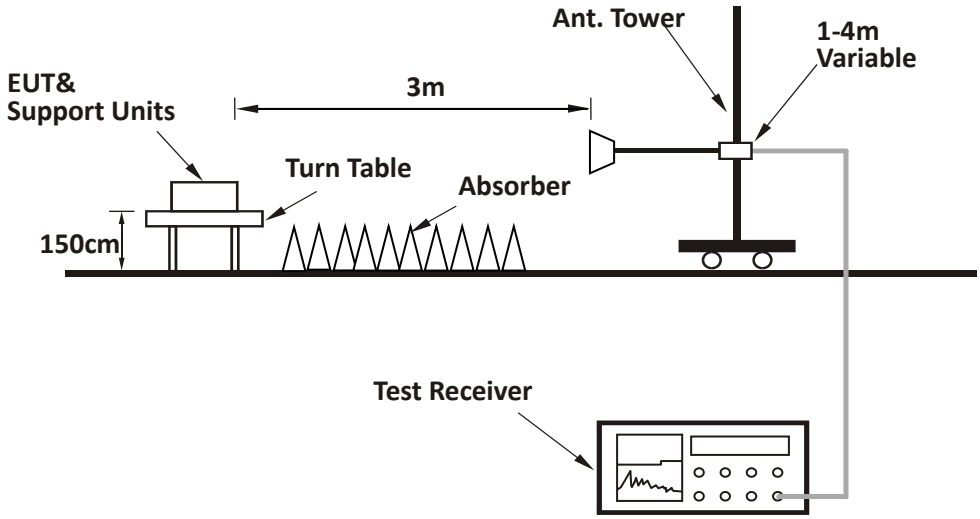
For Radiated emission above 1GHz:

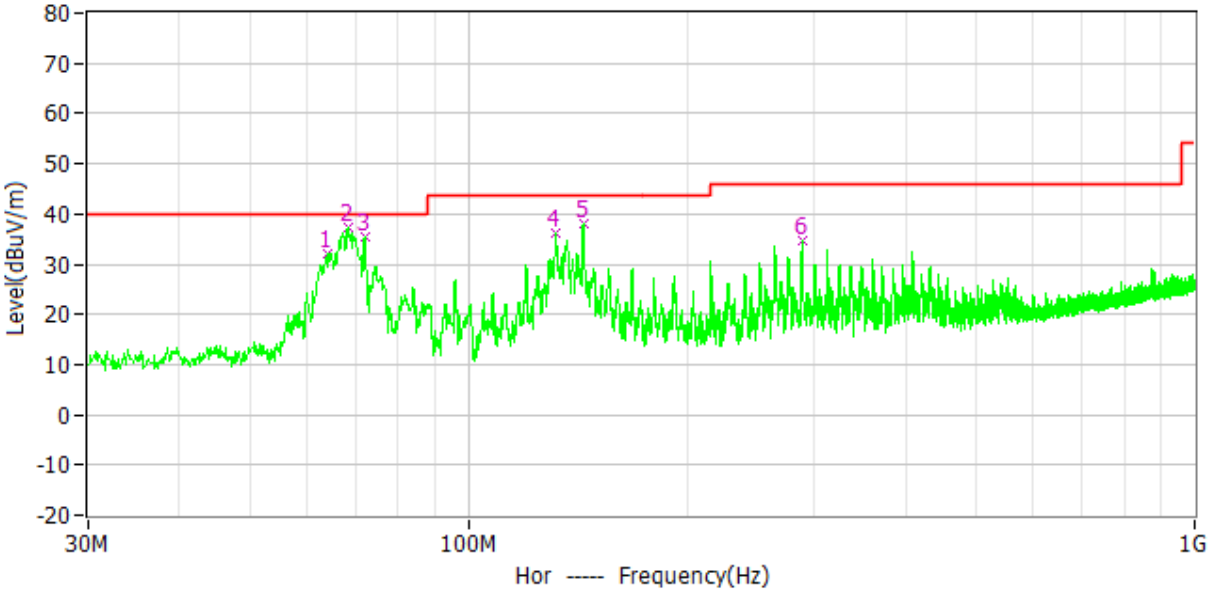


7.4 Test Results of Radiated Emissions

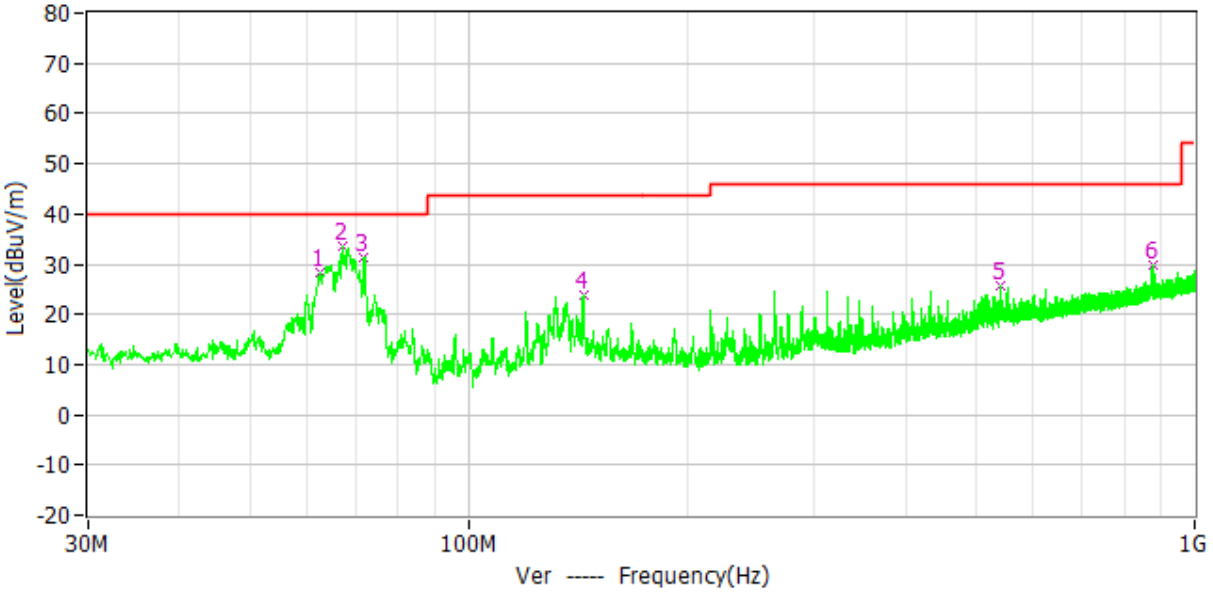
The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

The worst data was listed in the report and the worst waveform from 30MHz to 1000MHz is listed as below:

Horizontal



Vertical



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Test data 30MHz~1GHz:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Correct Factor (dB/m)	Limits (dBμV/m)	Margin (dB)	Detector
H	64.241	32.1	13.2	40.0	7.9	QP
	68.218	37.2	12.7	40.0	2.8	QP
	72.001	35.4	12.0	40.0	4.6	QP
	132.044	36.0	13.3	43.5	7.5	QP
	143.975	37.9	14.2	43.5	5.6	QP
	288.020	34.7	14.7	46.0	11.3	QP
V	62.592	28.5	13.5	40.0	11.5	QP
	67.248	33.4	12.8	40.0	6.6	QP
	71.807	31.2	12.0	40.0	8.8	QP
	143.975	23.9	14.2	43.5	19.6	QP
	539.929	25.6	20.8	46.0	20.4	QP
	874.385	29.9	25.8	46.0	16.1	QP

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Measured level = Reading Level + Correct Factor
3. Margin = Limit - Measured level
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

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Test result above 1GHz:

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Type
L	H	2405.00	99.8	32.5	Fundamental	/	PK
	V	2405.00	95.6	32.5	Fundamental	/	PK
	H	2390.00	47.7	32.5	74.00	26.3	PK
	V	2390.00	47.0	32.5	74.00	27.0	PK
	H	4810.00	52.5	-13.7	74.00	21.5	PK
	H	7215.00	55.7	-8.2	74.00	18.3	PK
	H	7215.00	38.2	-8.2	54.00	15.8	AV
	H	9620.00	42.1	-4.3	74.00	31.9	PK
	V	4810.00	51.2	-13.7	74.00	22.8	PK
	V	7215.00	51.4	-8.2	74.00	22.6	PK
	V	9620.00	42.6	-4.3	74.00	31.4	PK
M	H	4890.00	49.2	-14.0	74.00	24.8	PK
	H	7335.00	53.6	-8.4	74.00	20.4	PK
	H	9780.00	41.7	-4.2	74.00	32.3	PK
	V	4890.00	49.6	-14.0	74.00	24.4	PK
	V	7335.00	50.2	-8.4	74.00	23.8	PK
	V	9780.00	41.9	-4.2	74.00	32.1	PK
H	H	2480.00	98.5	32.8	Fundamental	/	PK
	V	2480.00	93.1	32.8	Fundamental	/	PK
	H	2483.50	56.0	32.9	74.00	18.0	PK
	H	2483.50	48.4	32.9	54.00	5.6	AV
	V	2483.50	51.9	32.9	74.00	22.1	PK
	H	4960.00	51.0	-13.7	74.00	23.0	PK
	H	7440.00	53.3	-8.2	74.00	20.7	PK
	H	9920.00	40.6	-4.2	74.00	33.4	PK
	V	4960.00	51.2	-13.7	74.00	22.8	PK

	V	7440.00	50.3	-8.2	74.00	23.7	PK
	V	9920.00	40.8	-4.2	74.00	33.2	PK

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
2. Measured level = Reading Level + Correct Factor
3. Margin = Limit - Measured level
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
Limit = 40.00dBuV/m.
Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

8 Antenna requirement

Requirement:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Result:

EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

TEST REPORT

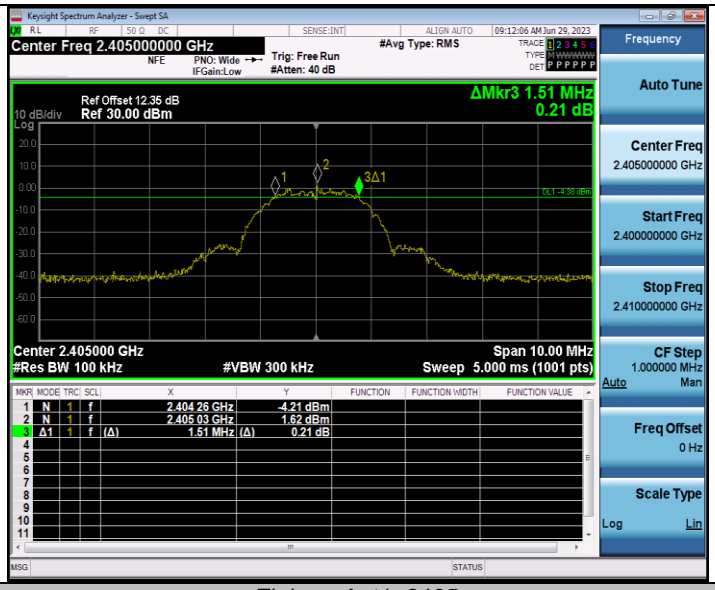
Appendix I: Test Result and Graphs

DTS Bandwidth

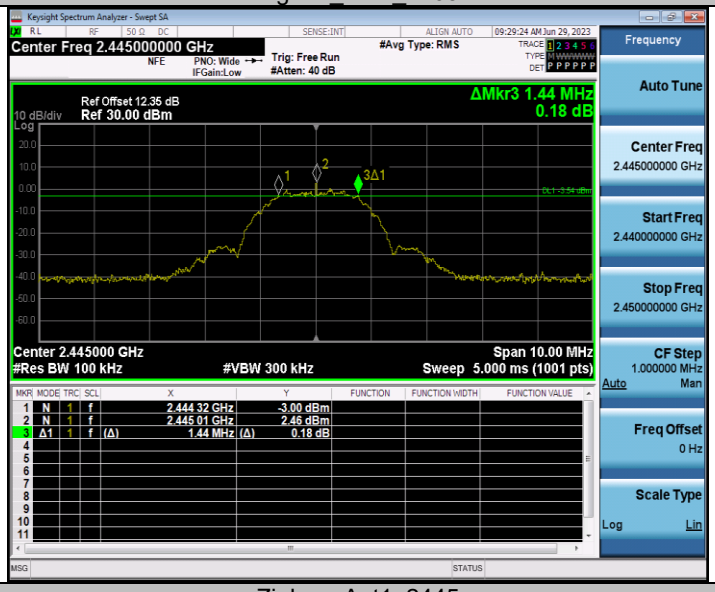
Test Result

Test Mode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
Zigbee	Ant1	2405	1.510	2404.260	2405.770	0.5	PASS
		2445	1.440	2444.320	2445.760	0.5	PASS
		2480	1.430	2479.310	2480.740	0.5	PASS

Test Graphs



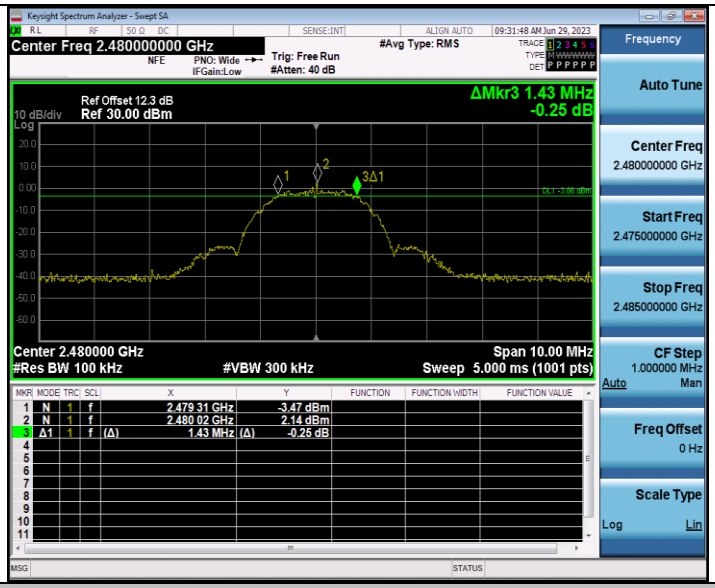
Zigbee_Ant1_2405



Zigbee_Ant1_2445

Total Quality. Assured.

TEST REPORT



Zigbee_Ant1_2480

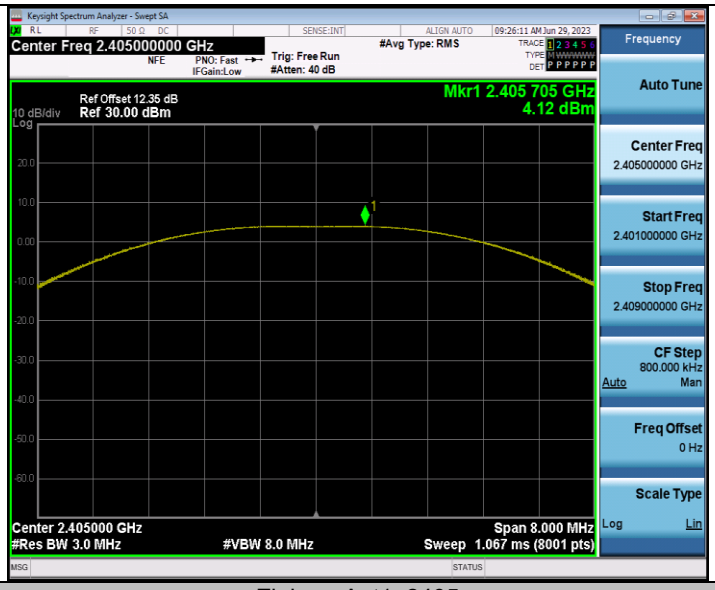
TEST REPORT

Maximum conducted output power

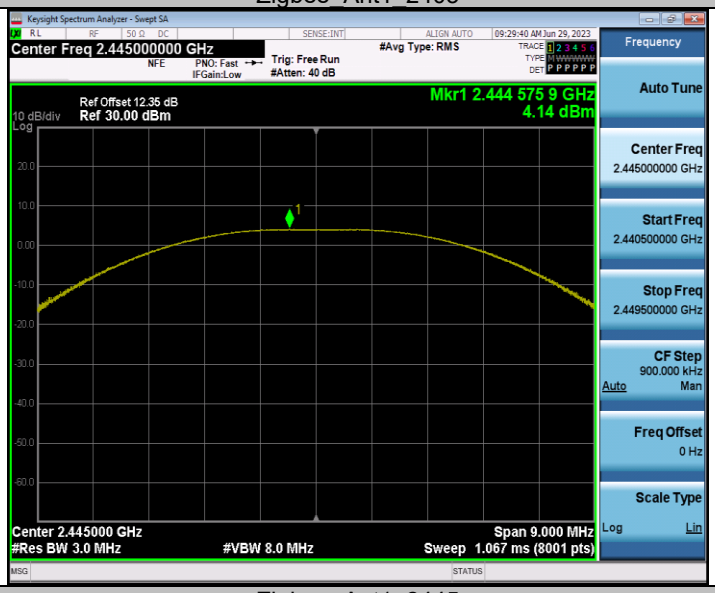
Test Result

Test Mode	Antenna	Freq(MHz)	Result[dBm]	Limit[dBm]	Verdict
Zigbee	Ant1	2405	4.12	≤30	PASS
		2445	4.14	≤30	PASS
		2480	4.21	≤30	PASS

Test Graphs

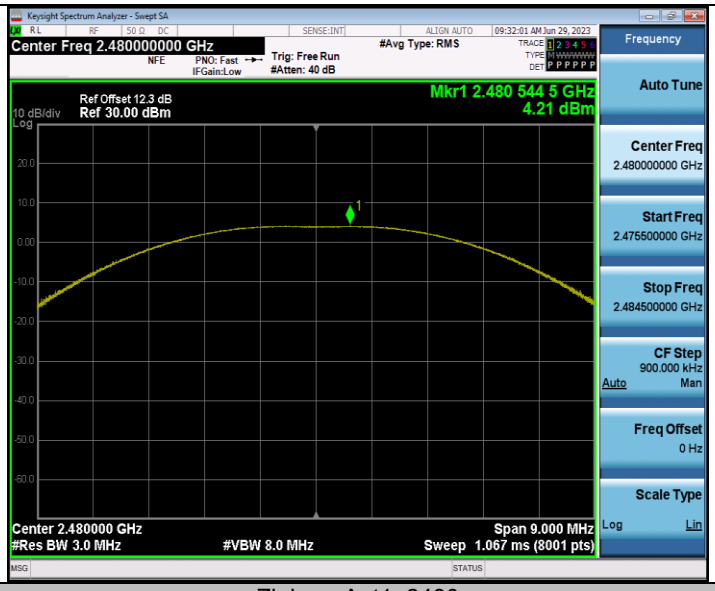


Zigbee_Ant1_2405



Zigbee_Ant1_2445

TEST REPORT



Zigbee_Ant1_2480

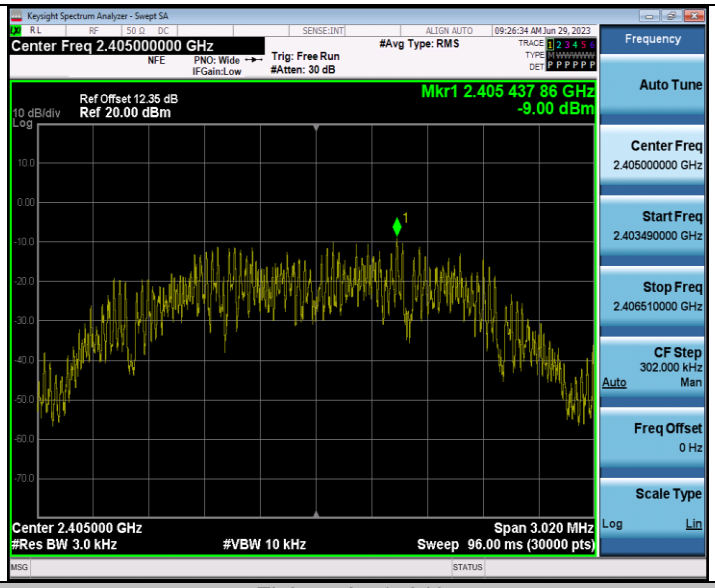
TEST REPORT

Maximum power spectral density

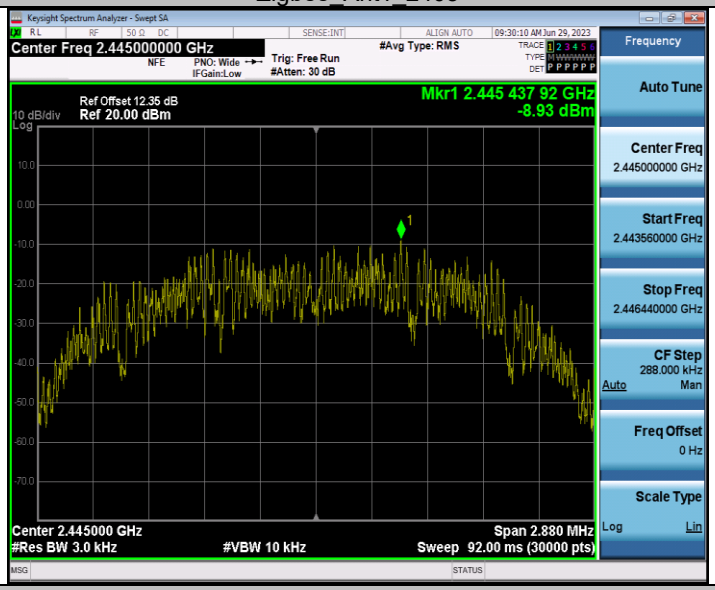
Test Result

Test Mode	Antenna	Freq(MHz)	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
Zigbee	Ant1	2405	-9.00	≤8.00	PASS
		2445	-8.93	≤8.00	PASS
		2480	-8.94	≤8.00	PASS

Test Graphs



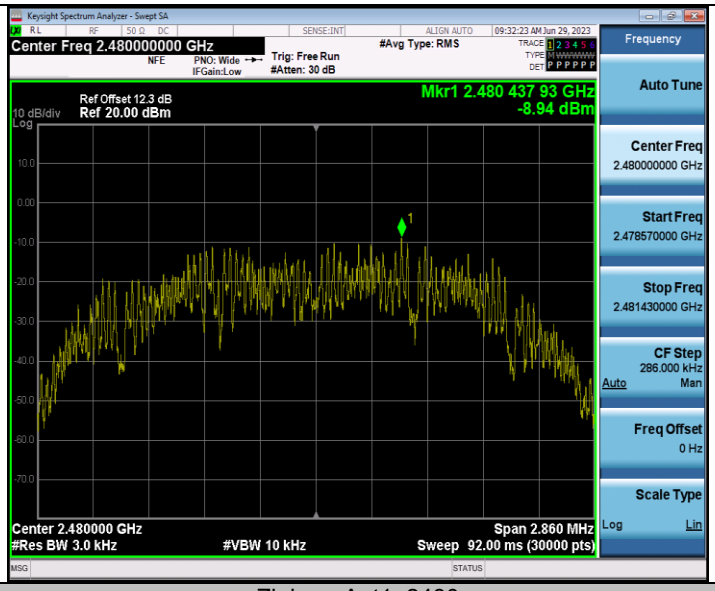
Zigbee_Ant1_2405



Zigbee_Ant1_2445

Total Quality. Assured.

TEST REPORT



Zigbee_Ant1_2480

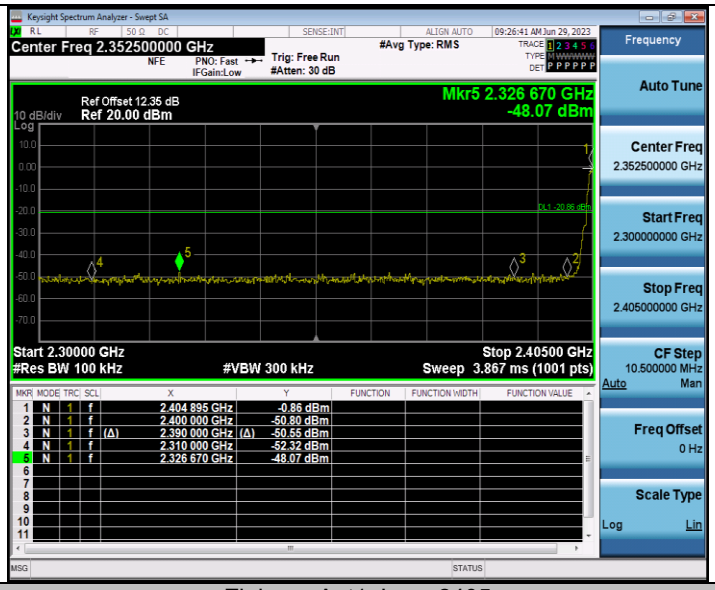
TEST REPORT

Band edge measurements

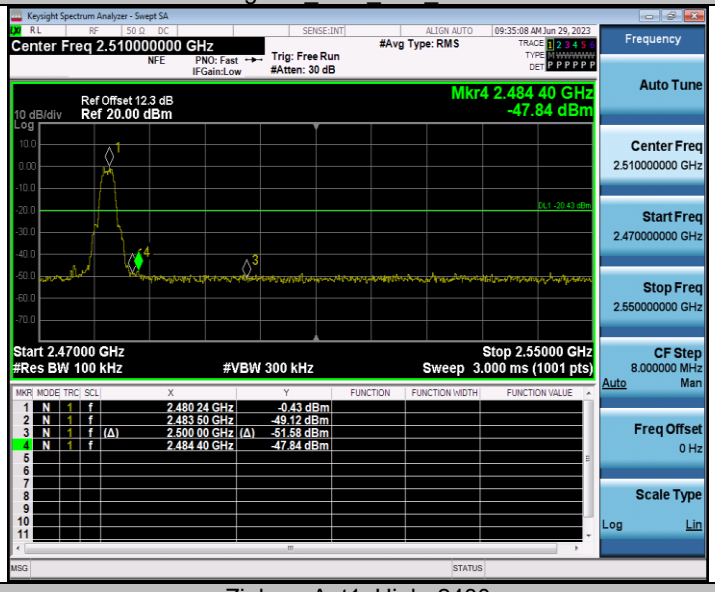
Test Result

Test Mode	Antenna	ChName	Freq(MHz)	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
Zigbee	Ant1	Low	2405	-0.86	-48.08	≤-20.86	PASS
		High	2480	-0.43	-47.84	≤-20.43	PASS

Test Graphs



Zigbee _Ant1_Low_2405



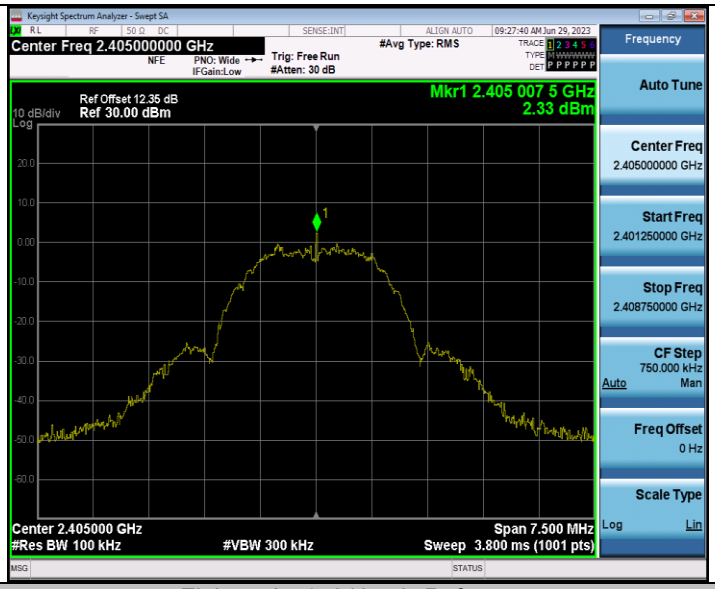
Zigbee_Ant1_High_2480

Conducted Spurious Emission

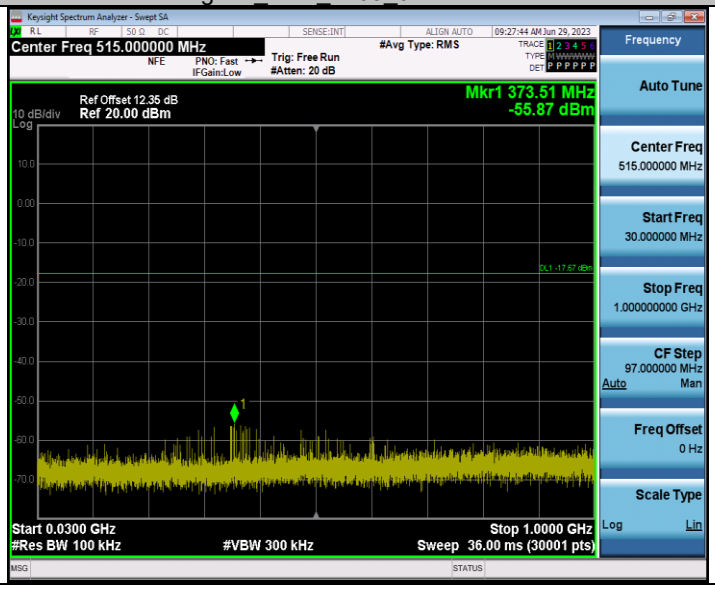
Test Result

Test Mode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
Zigbee	Ant1	2405	Reference	2.33	2.33	---	PASS
			30~1000	2.33	-55.88	≤-17.67	PASS
			1000~26500	2.33	-51.08	≤-17.67	PASS
		2445	Reference	2.60	2.60	---	PASS
			30~1000	2.60	-54.72	≤-17.4	PASS
			1000~26500	2.60	-51.57	≤-17.4	PASS
		2480	Reference	1.98	1.98	---	PASS
			30~1000	1.98	-55.24	≤-18.02	PASS
			1000~26500	1.98	-52.02	≤-18.02	PASS

Test Graphs

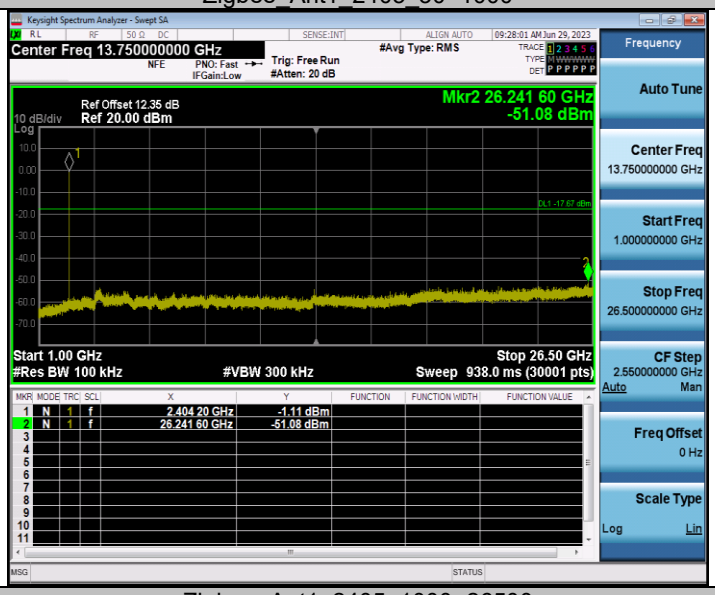


Zigbee_Ant1_2405_0~Reference

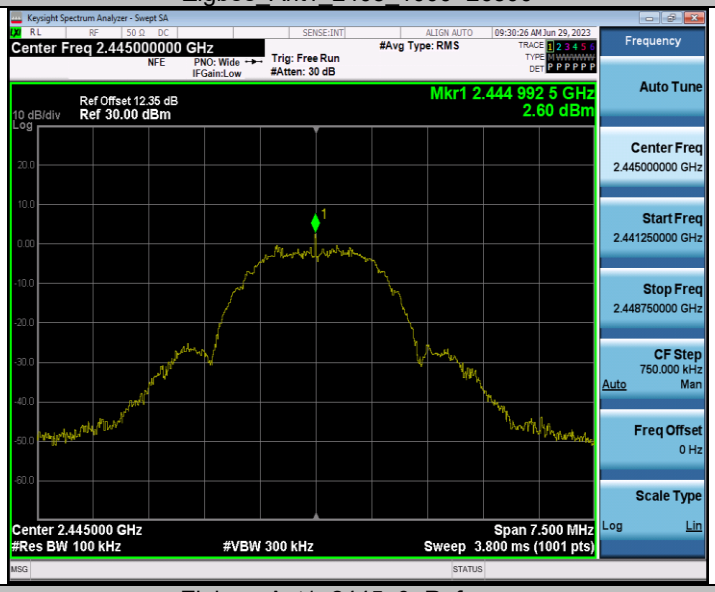


TEST REPORT

Zigbee_Ant1_2405_30~1000

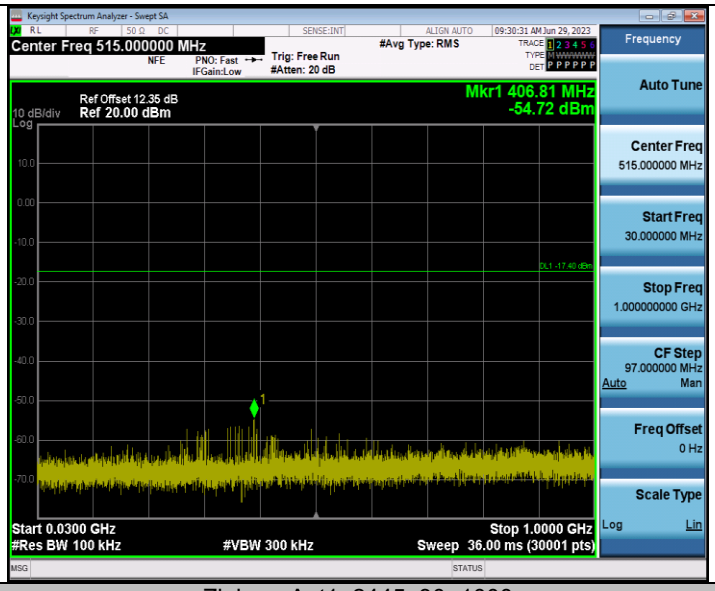


Zigbee_Ant1_2405_1000~26500

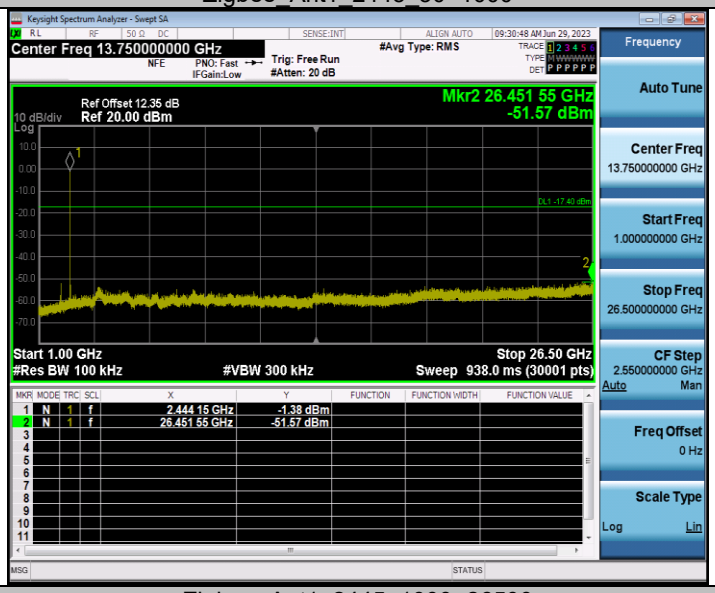


Zigbee_Ant1_2445_0~Reference

TEST REPORT

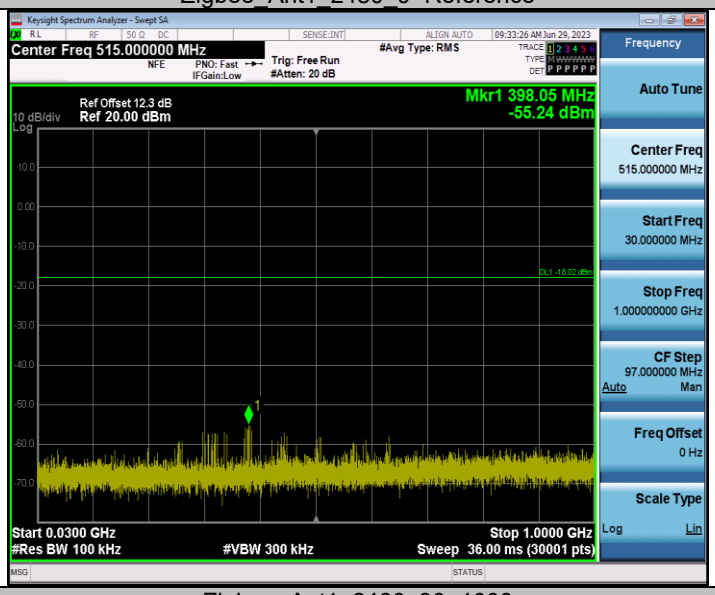
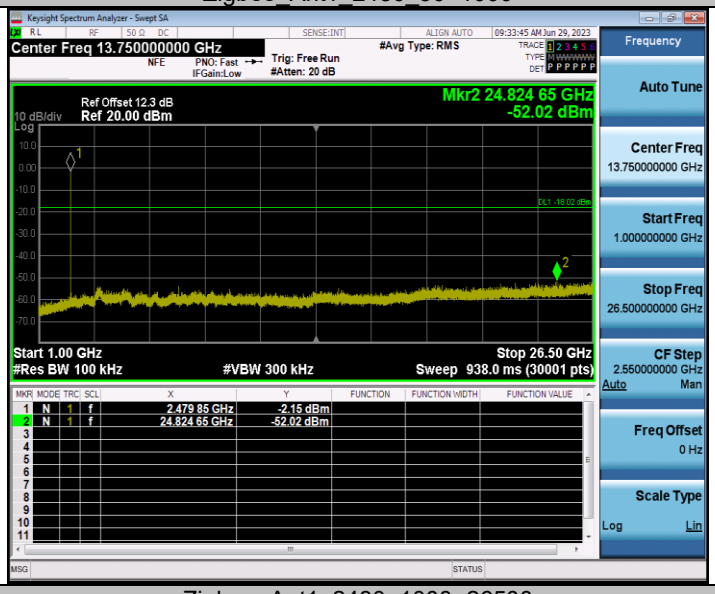


Zigbee_Ant1_2445_30~1000



Zigbee_Ant1_2445_1000~26500

TEST REPORT

Zigbee_Ant1_2480_0~Reference

Zigbee_Ant1_2480_30~1000

Zigbee_Ant1_2480_1000~26500

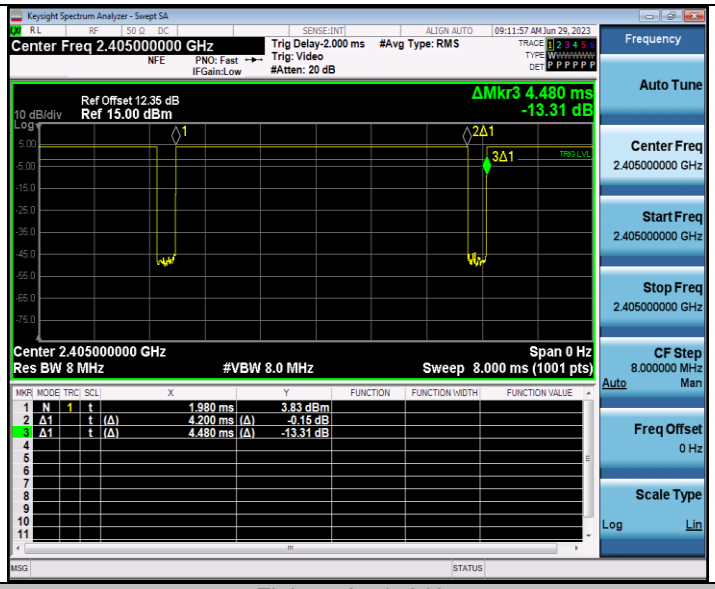
TEST REPORT

Duty Cycle

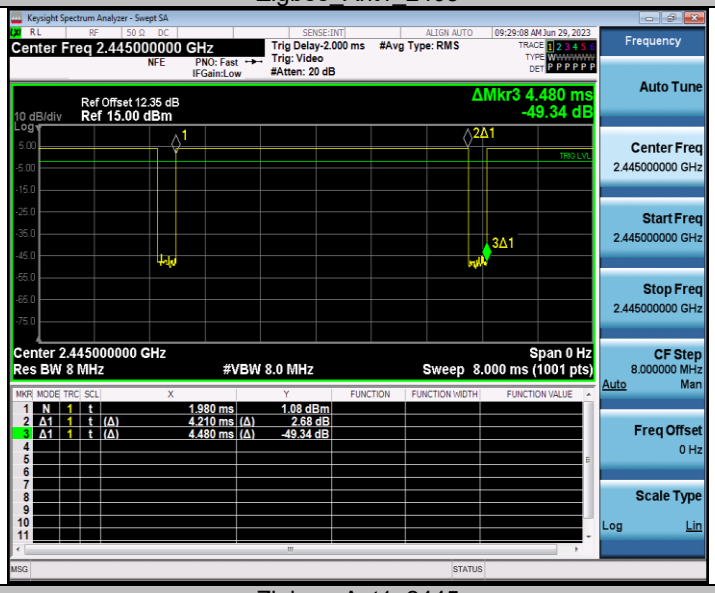
Test Result

Test Mode	Antenna	Freq(MHz)	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Limit	Verdict
Zigbee	Ant1	2405	4.20	4.48	93.75	---	---
		2445	4.21	4.48	93.97	---	---
		2480	4.21	4.48	93.97	---	---

Test Graphs

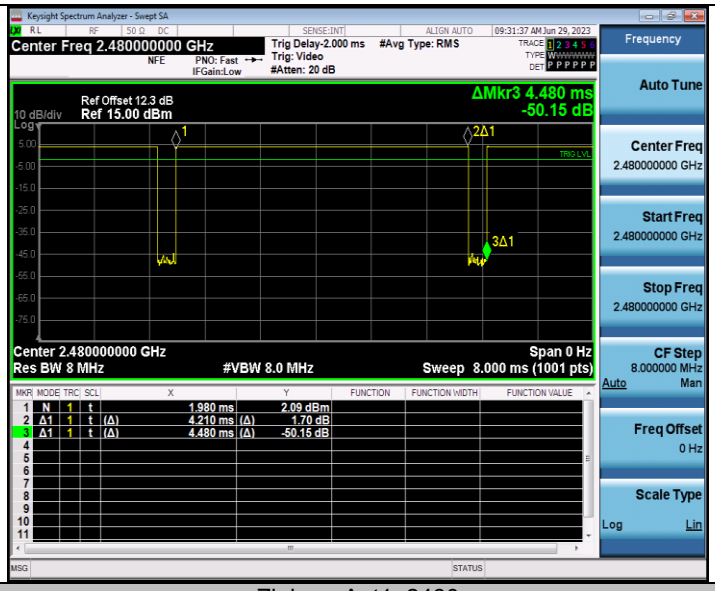


Zigbee_Ant1_2405



Zigbee_Ant1_2445

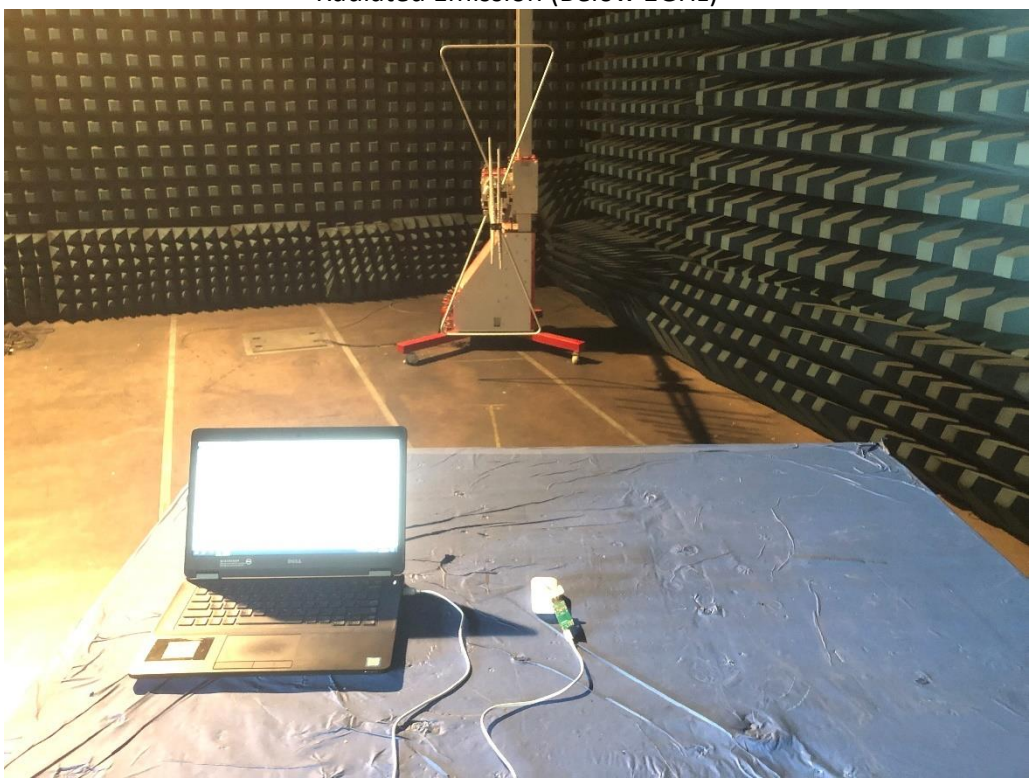
TEST REPORT



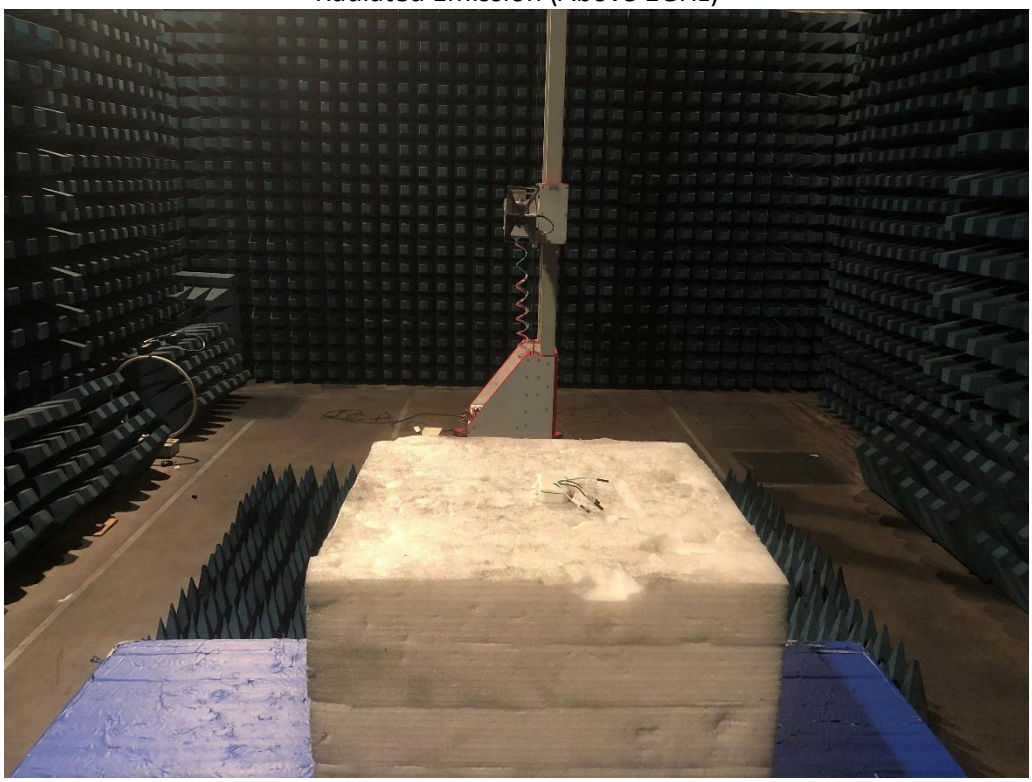
Zigbee_Ant1_2480

Appendix II: Test Setup photos

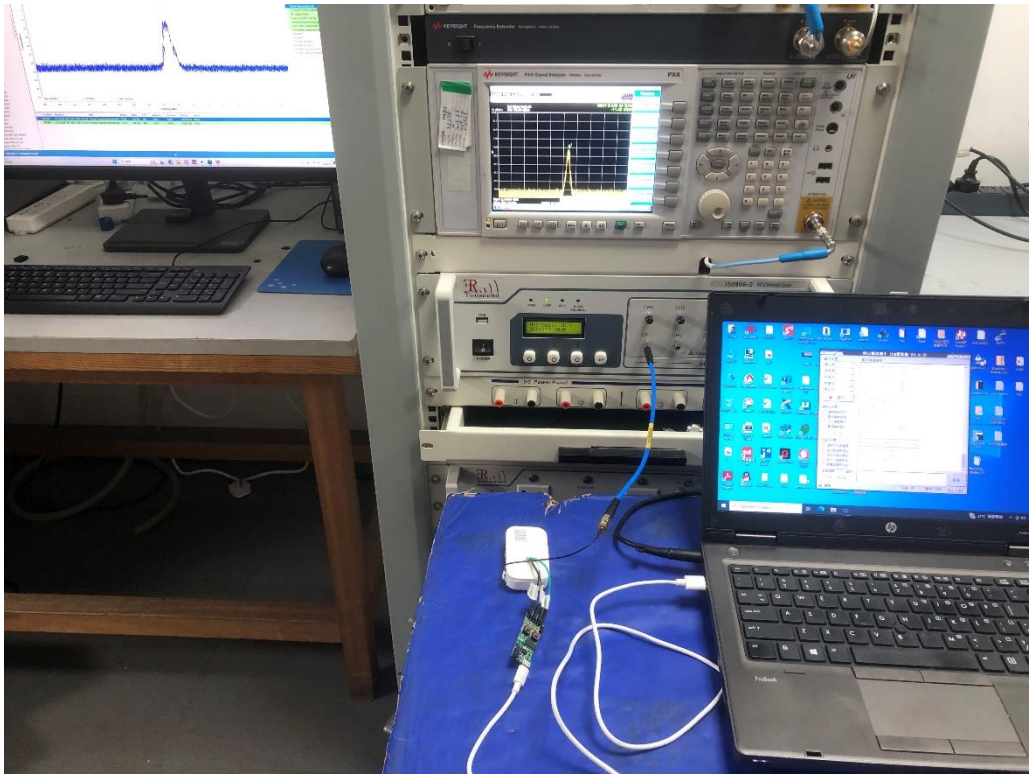
Radiated Emission (Below 1GHz)



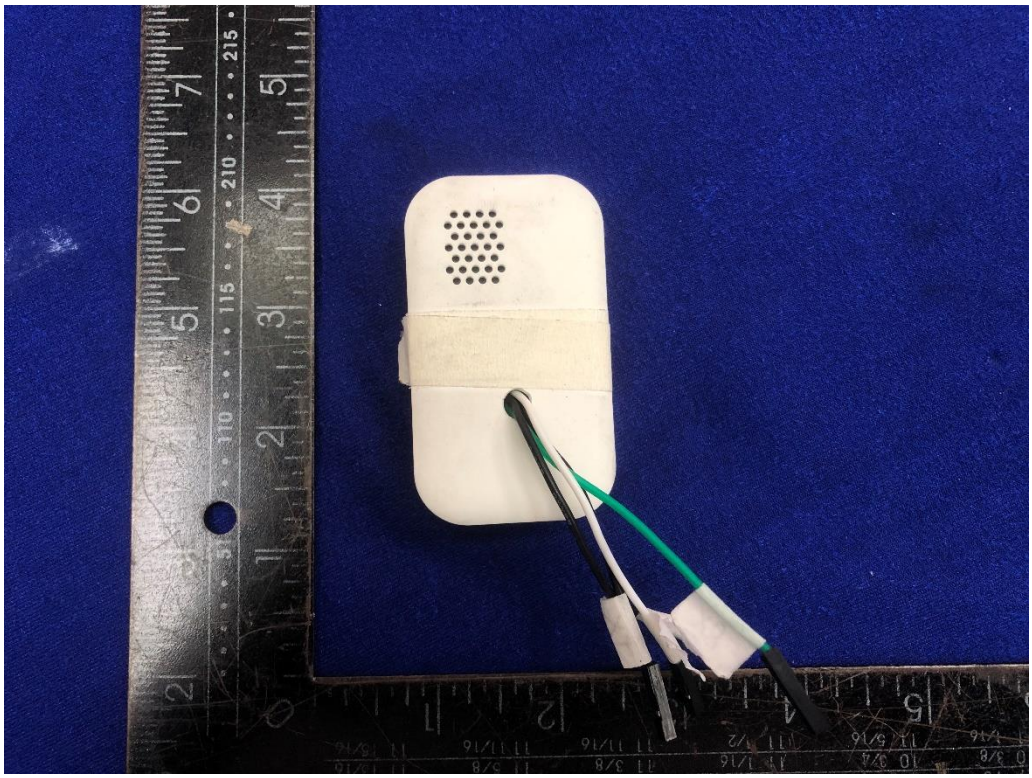
Radiated Emission (Above 1GHz)

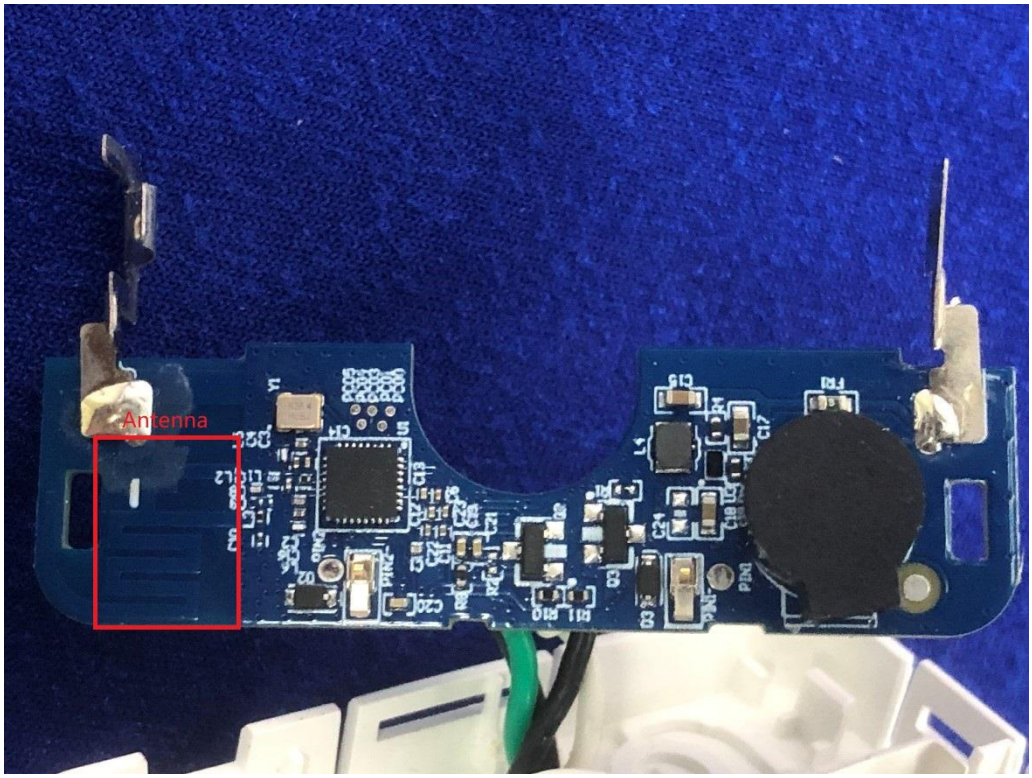


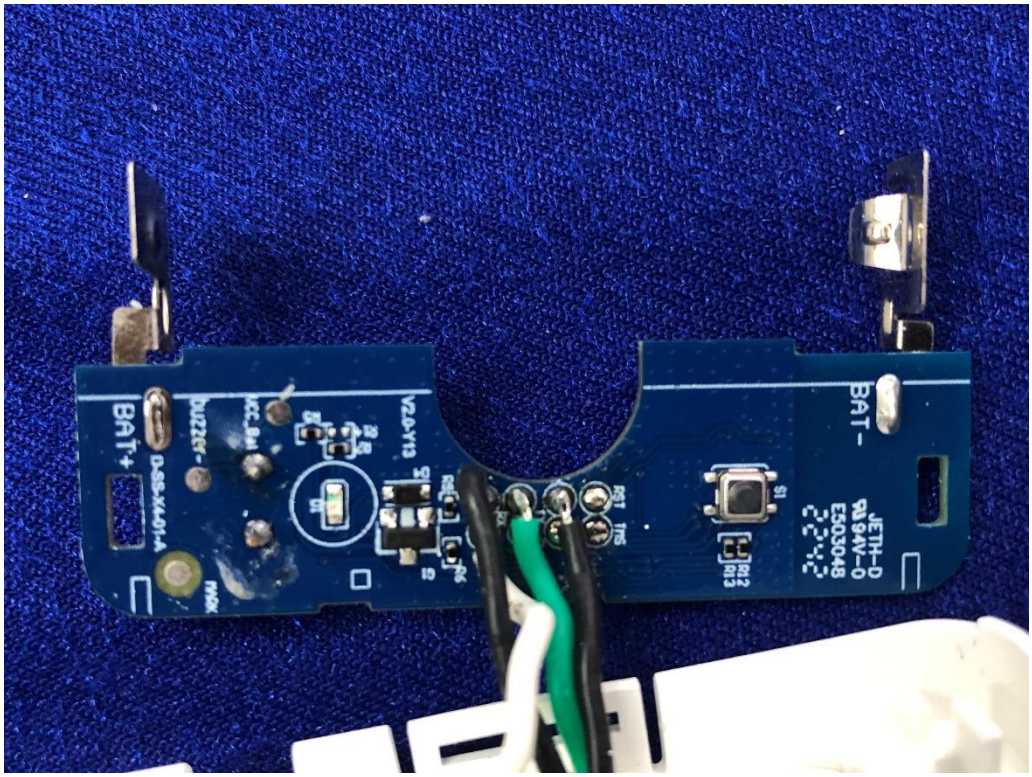
Conducted RF Test

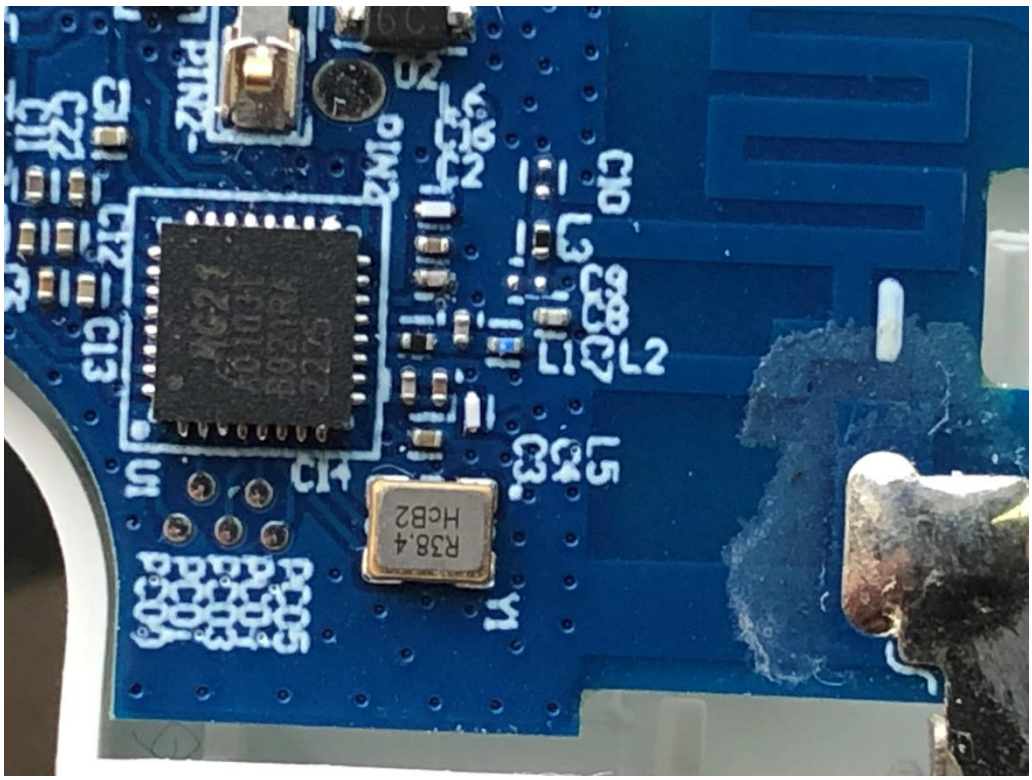


Appendix III: Photograph of equipment under test




Antenna


BAT+
BUZZER-
BAT-
JETH-D
94V-0
E503048


PIN2
C10
L3
L2
L5
C13
C14
U1
R38.4
HcB2
Y1

********** END **********