



TEST REPORT

Reference No...... : WTU22F10202727W001
FCC ID : 2AJ2N-W902-DZB
Applicant..... : EuControls Corporation
Address..... : 19210 S. Vermont Ave Bldg C, Ste 310 Gardena, CA 90248 United States
Manufacturer : The same as above
Address..... : The same as above
Product Name..... : W902-DZB Zigbee
Model No...... : W902-DZB
Test specification..... : FCC CFR47 Part 15 Subpart C (Section 15.247): 2020
Date of Receipt sample : 2022-10-20
Date of Test : 2022-10-28 to 2022-11-22
Date of Issue..... : 2022-11-23
Test Report Form No. : WEW-15247A-01A
Test Result..... : **Pass**

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of approver.

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1 Revision History

Test Report No.	Date of Issue	Description	Status
WTU22F10202727W001	2022-11-23	Original	Valid

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3 General Information

3.1 General Description of E.U.T

Product Name : W902-DZB Zigbee
Model No. : W902-DZB
Model Description : ---
Rated Voltage..... : 120-277Vac, 0.035A
Battery Capacity : ---
Power Adapter : ---

3.2 Technical Characteristics of EUT

Support Standards : IEEE 802.15.4
Frequency Range : 2405-2475MHz
RF Output Power : 15.860dBm (Conducted)
Modulation : OQPSK
Quantity of Channels : 15
Channel Separation..... : 5MHz
Type of Antenna : External IPEX Antenna
Antenna Gain : 2.7dBi

3.3 Standards Applicable for Testing

The tests were performed according to following standards:

FCC Rules Part 15.247	Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz
558074 D01 15.247 Meas Guidance v05r02	Guidance For Compliance Measurements On Digital Transmission System, Frequency Hopping Spread Spectrum System, And Hybrid System Devices Operating Under Section 15.247 Of The FCC Rules
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices



3.4 Test Facility

The test facility has a test site registered with the following organizations:

● **ISED – Registration No.: 21895**

Waltek Testing Group (Foshan) Co., Ltd. has been registered and fully described in a report filed with the Innovation, Science and Economic Development Canada (ISED). The acceptance letter from the ISED is maintained in our files. Registration ISED number: 21895, March 12, 2019

● **FCC – Registration No.: 820106**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 820106, August 16, 2018

● **FCC – Designation No.: CN5034**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Designation No. CN5034.

● **NVLAP – Lab Code: 600191-0**

Waltek Testing Group (Foshan) Co., Ltd. EMC Laboratory is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP/NIST). NVLAP Code: 600191-0.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

3.5 Subcontracted

Whether parts of tests for the product have been subcontracted to other labs:

Yes No

If Yes, list the related test items and lab information:

Test items: ---

Lab information: ---

3.6 Abnormalities from Standard Conditions

None.

3.7 Disclaimer

The antenna gain information is provided by the customer. The laboratory is not responsible for the accuracy of the antenna gain information.



4 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, with a duty cycle equal to 100%, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List

Test Mode	Description	Remark
TM1	Low Channel	2405MHz
TM2	Middle Channel	2440MHz
TM3	High Channel	2475MHz

Test Conditions

Temperature:	22~25°C
Relative Humidity:	50~55%
Atmospheric pressure:	101.9kPa

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5 Equipment Used during Test

5.1 Equipment List

<input type="checkbox"/> Conducted Emissions 1#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal Date	Cal Due Date
1.	EMI Test Receiver	R&S	ESR3	102423	2022-01-06	2023-01-05
2.	LISN	R&S	ENV216	101343	2022-01-06	2023-01-05
3.	Cable	HUBER+SUHNER	CBL2-NN-6M	223NN624	2022-01-06	2023-01-05
4.	Switch	CD	RSU-A4 18G	RSUA4008	2022-01-06	2023-01-05
<input checked="" type="checkbox"/> Conducted Emissions 2#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal Date	Cal Due Date
1.	EMI Test Receiver	R&S	ESCI	101178	2022-01-06	2023-01-05
2.	LISN	R&S	ENV216	101215	2022-01-06	2023-01-05
3.	Cable	HUBER+SUHNER	CBL2-NN-6M	6102701	2022-01-06	2023-01-05
4.	Switch	ESE	RSU/M2	---	2022-01-07	2023-01-06
<input type="checkbox"/> Conducted Emissions 3#						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal Date	Cal Due Date
1.	EMI Test Receiver	R&S	ESR3	102842	2022-01-06	2023-01-05
2.	LISN	R&S	ENV216	101542	2022-01-06	2023-01-05
3.	Cable	YIHENG	LMR195UF-NMNM-2.5	---	2022-01-07	2023-01-06
4.	Manual RF Switch	YIHENG	SW-2	RSU0402	2022-01-07	2023-01-06
<input checked="" type="checkbox"/> Radiation Emissions						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	3m Semi-anechoic Chamber	CHANGCHUANG	9m×6m×6m	-	2021-01-11	2024-01-10
2.	EMI Test Receiver	RS	ESR7	101566	2022-01-07	2023-01-06
3.	EMC Analyzer	Agilent	N9020A	MY48011796	2022-05-17	2023-05-16
4.	Active Loop Antenna	SCHWARZBECK	FMZB1519B	00004	2022-01-10	2023-01-09
5.	Trilog Broadband Antenna	SCHWARZBECK	VULB 9162	9162-117	2022-01-09	2023-01-08
6.	Coaxial Cable (below 1GHz)	H+S	CBL3-NN-12+3 m	214NN320	2022-01-07	2023-01-06
7.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9120 D	01561	2022-01-09	2023-01-08
8.	Broad-band Horn Antenna	SCHWARZBECK	BBHA 9170	01119	2022-01-09	2023-01-08
9.	Coaxial Cable (above 1GHz)	Times-Microwave	CBL5-NN	-	2022-01-06	2023-01-05
10.	Amplifier	Lunar E M	LNA1G18-40	20160501002	2022-01-06	2023-01-05



<input checked="" type="checkbox"/> RF Conducted Testing						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Calibration Date	Calibration Due Date
1.	Spectrum Analyzer	Agilent	N9020A	MY48011796	2022-05-17	2023-05-16
2.	Analog Signal Generator	Agilent	N5181A	MY48180720	2022-01-06	2023-01-05
3.	RF Control Unit	CHANGCHUANG	JS0806-2	-	2022-01-06	2023-01-05

: Not Used

: Used

5.2 Test Software

Description	Manufacturer	Model	Version
EMI Test Software (Conducted Emission 1#)	FARATRONIC	EZ-EMC	EMEC-3A1
EMI Test Software (Conducted Emission 2#)	FARATRONIC	EZ-EMC	CON-03A1
EMI Test Software (Conducted Emission 3#)	FARATRONIC	EZ-EMC	COM 3A1.1
EMI Test Software (Radiated Emission)	FARATRONIC	EZ-EMC	RA-03A1-1
RF Conducted Test Software	TONSCEND	JS1120-2	V2.6

5.3 Special Accessories and Auxiliary Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.
1.	/	/	/	/

5.4 Measurement Uncertainty

Parameter	Uncertainty
RF Output Power	±2.2dB
Occupied Bandwidth	±1.5%
Conducted Emission	±2.6dB
Transmitter Spurious Emission	±3.8dB (for 25MHz-1GHz)
	±5.0dB (for 1GHz-18GHz)



6 Summary of Test Result

Test Items	FCC Rules	Result
Antenna Requirement	§15.203; §15.247(b)(4)(i)	Compliant
Restricted Band of Operation	§15.205	Compliant
Conducted Emissions	§15.207(a)	Compliant
Radiated Spurious Emissions	§15.209(a)	Compliant
Power Spectral Density	§15.247(e)	Compliant
6dB Bandwidth	§15.247(a)(2)	Compliant
RF Output Power	§15.247(b)(3)	Compliant
Band edge (Out of Band Emissions)	§15.247(d)	Compliant

Remark:

- Pass Test item meets the requirement
 Fail Test item does not meet the requirement
 N/A Test case does not apply to the test object

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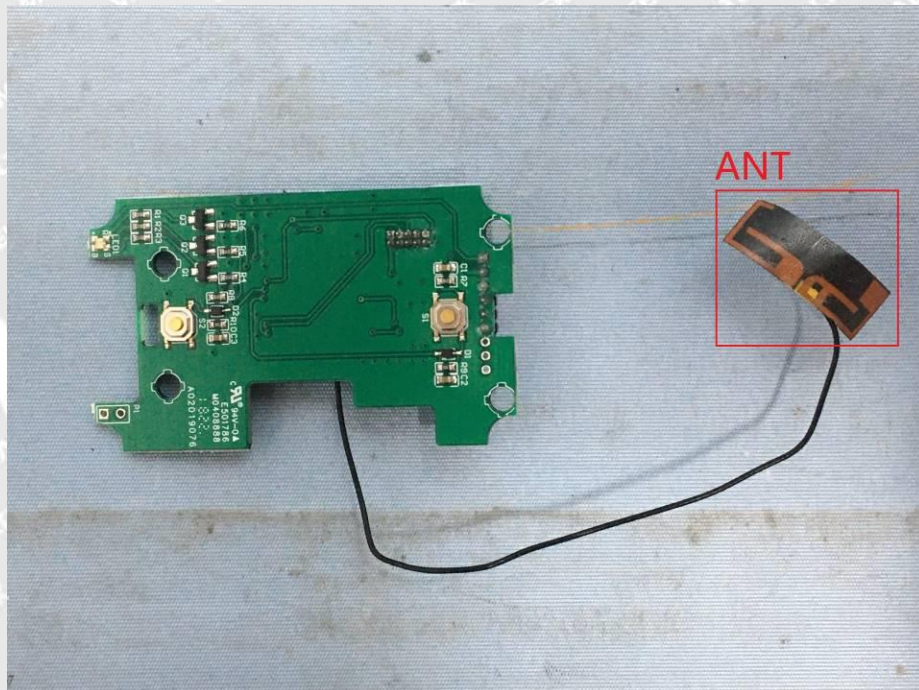
6.1 Antenna Requirement

6.1.1 Standard Applicable

According to FCC Part 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. 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.

6.1.2 Evaluation Information

The EUT has a External IPEX Antenna, the gain is 2.7 dBi, fulfil the requirement of this section.





6.2 Field Strength of Spurious Emissions

6.2.1 Standard Applicable

According to §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).

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

6.2.2 Test Procedure

- 1) The EUT is placed on a turntable, which is 0.8m(Below 1G) 1.5m(above 1G)above ground plane.
- 2) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- 3) EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions. The spectrum was investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
- 4) Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 5) And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 6) Repeat above procedures until the measurements for all frequencies are complete.
- 7) 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 Z position. So the data shown was the Z position only.



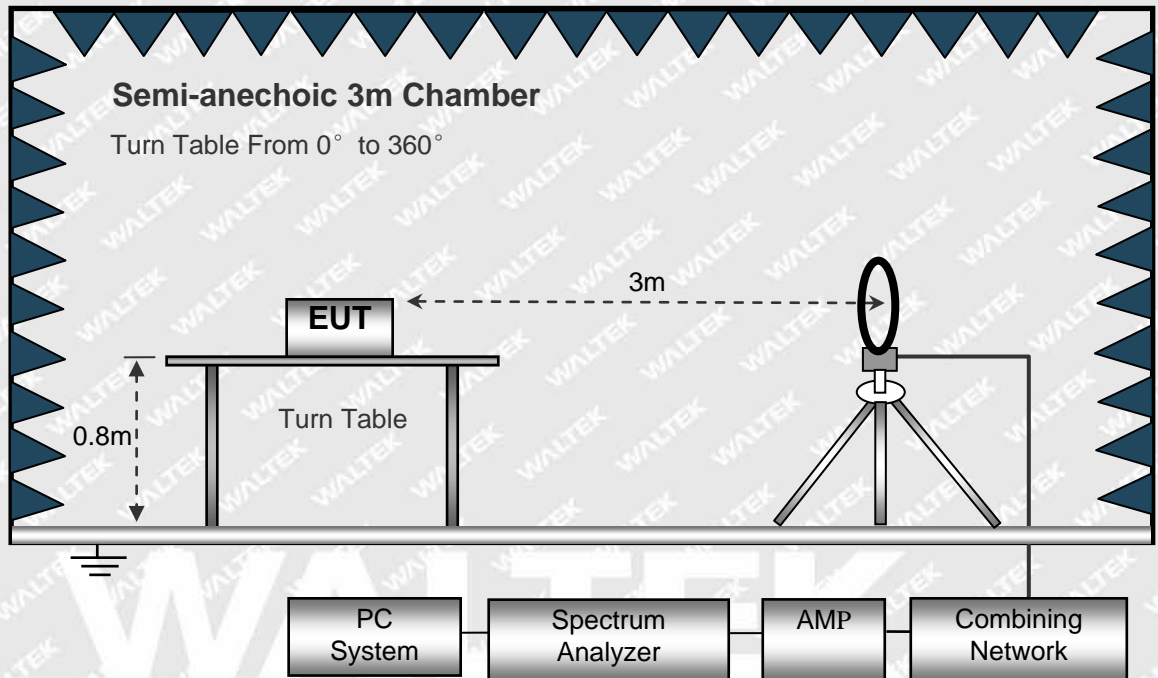
6.2.3 Test Setup

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

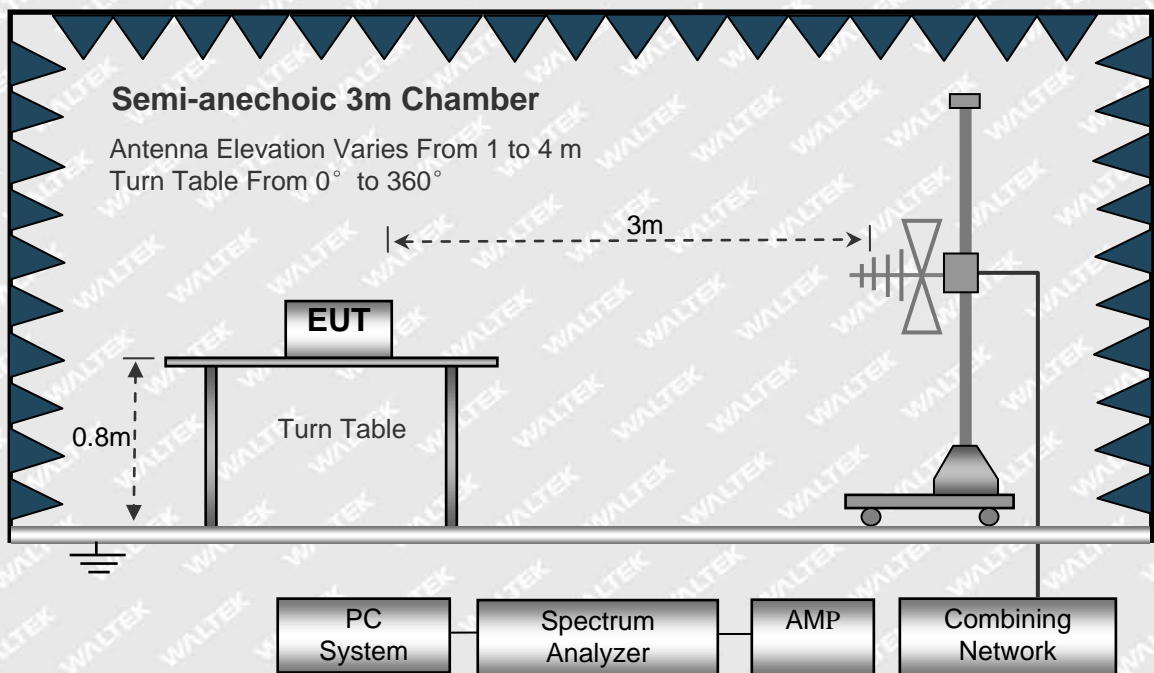
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The test setup for emission measurement below 30MHz.

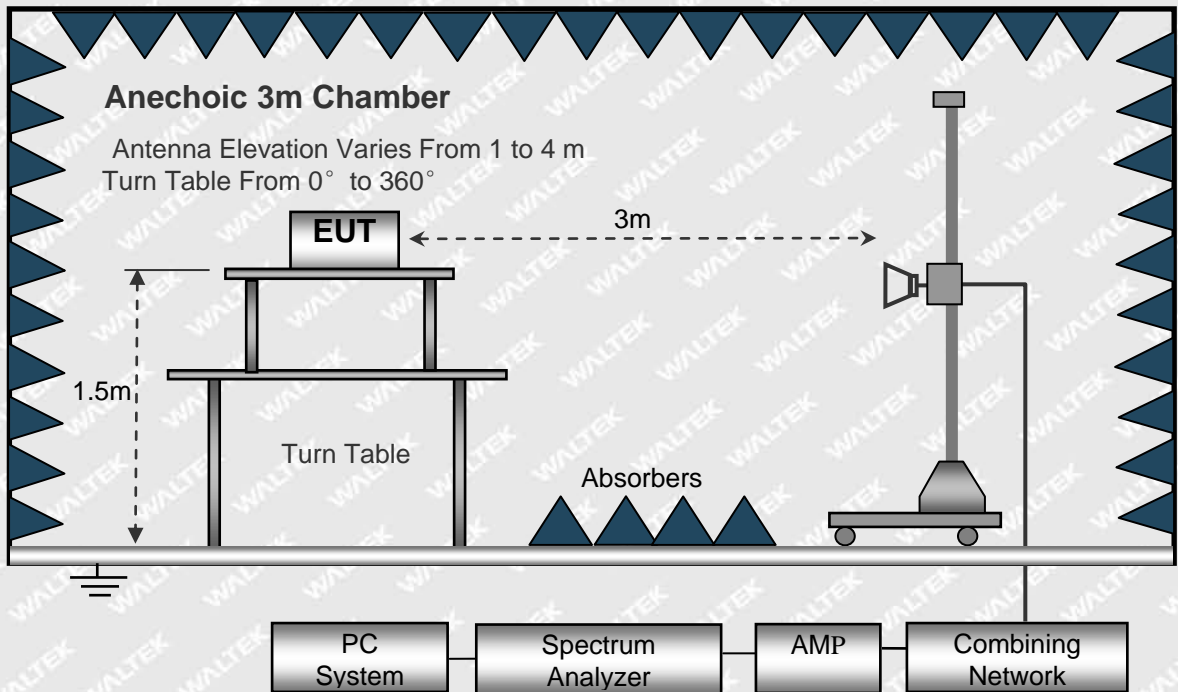


The test setup for emission measurement from 30 MHz to 1 GHz.





The test setup for emission measurement above 1 GHz.



6.2.4 Spectrum Analyzer Setup

9KHz-30MHz

RBW=10kHz

VBW=30kHz

Sweep time=Auto

Trace=Max hold

Detector function=peak

30MHz-1GHz

RBW=120kHz

VBW=300kHz

Sweep time=Auto

Trace=Max hold

Detector function=peak, QP

Above 1GHz

RBW=1MHz

VBW=3MHz(Peak), 10MHz(AV)

Sweep time=Auto

Trace=Max hold

Detector function=peak, AV

6.2.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Corr. Factor}$$

$$\text{Corr. Factor} = \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Limit}$$

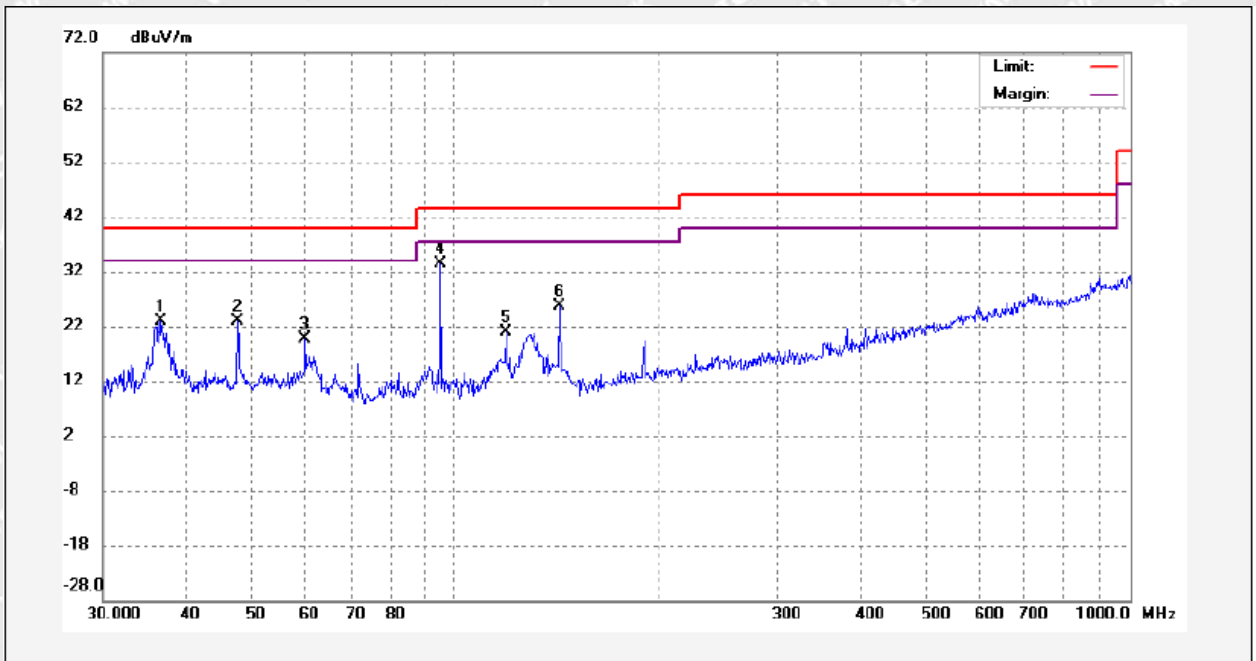


6.2.6 Test Results

Test Frequency: Below 1GHz

Test Channel Low

Polarization Vertical

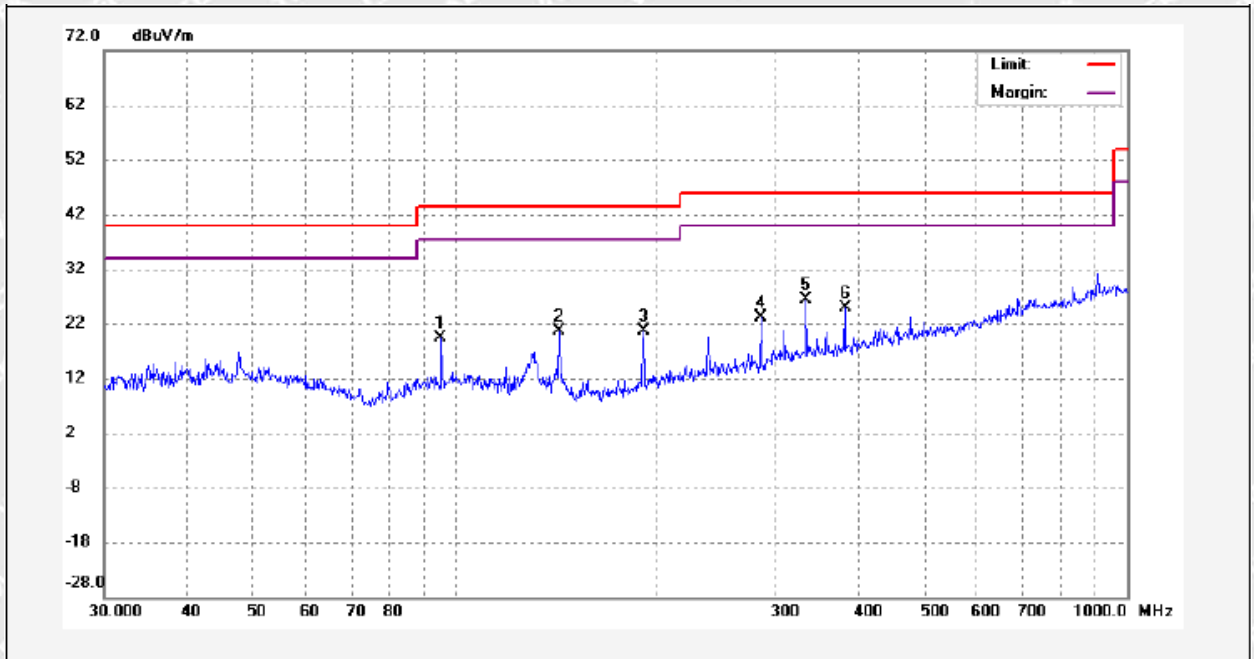


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	36.5220	10.18	12.62	22.80	40.00	-17.20	peak	
2	47.6251	8.88	13.89	22.77	40.00	-17.23	peak	
3	59.9428	6.23	13.43	19.66	40.00	-20.34	peak	
4	95.1930	21.80	11.58	33.38	43.50	-10.12	peak	
5	119.0179	7.86	12.91	20.77	43.50	-22.73	peak	
6	142.7742	14.04	11.63	25.67	43.50	-17.83	peak	



Test Channel Low

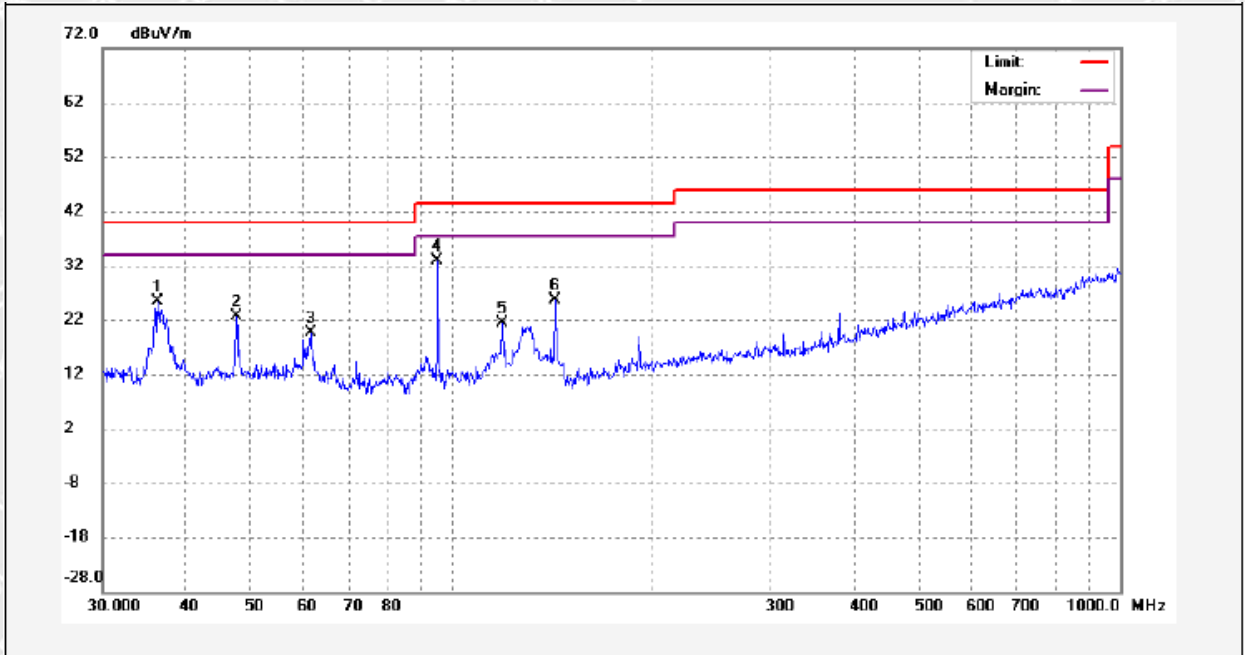
Polarization Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	95.2263	5.50	13.80	19.30	43.50	-24.20	peak	
2	142.8243	9.71	10.91	20.62	43.50	-22.88	peak	
3	190.4050	7.68	12.97	20.65	43.50	-22.85	peak	
4	285.6770	7.11	16.10	23.21	46.00	-22.79	peak	
5	333.2190	8.43	17.89	26.32	46.00	-19.68	peak	
6	380.8478	6.17	18.68	24.85	46.00	-21.15	peak	



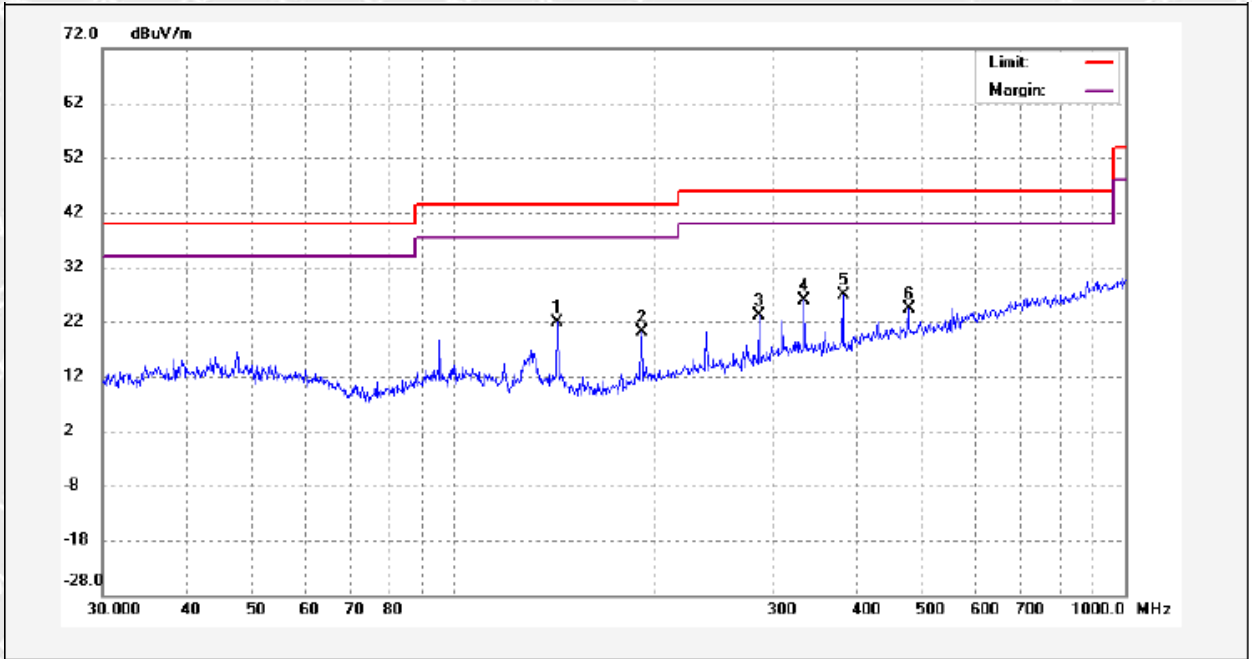
Test Channel Middle Channel Polarization Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	36.2794	12.80	12.58	25.38	40.00	-14.62	peak	
2	47.5751	8.64	13.89	22.53	40.00	-17.47	peak	
3	61.5618	6.63	13.00	19.63	40.00	-20.37	peak	
4	95.1930	21.28	11.58	32.86	43.50	-10.64	peak	
5	119.0597	8.54	12.91	21.45	43.50	-22.05	peak	
6	142.8243	14.10	11.63	25.73	43.50	-17.77	peak	



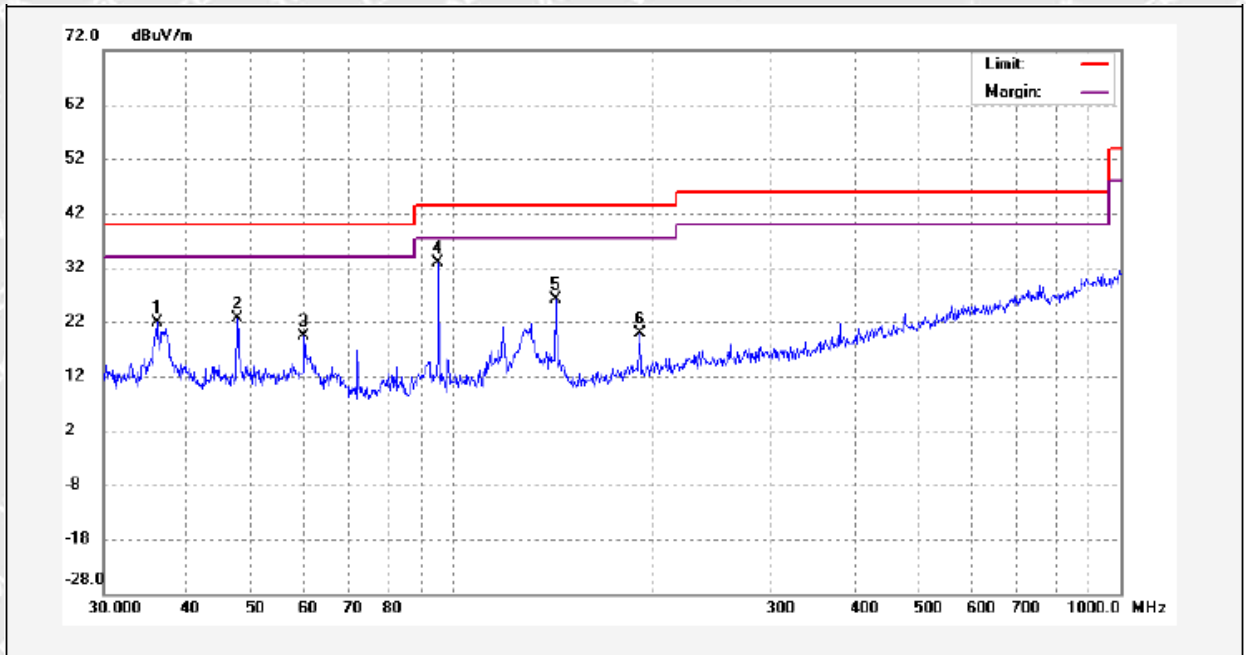
Test Channel Middle Channel Polarization Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	142.8243	10.96	10.91	21.87	43.50	-21.63	peak	
2	190.4716	7.20	12.98	20.18	43.50	-23.32	peak	
3	285.6770	6.98	16.10	23.08	46.00	-22.92	peak	
4	333.2190	8.06	17.89	25.95	46.00	-20.05	peak	
5	380.8478	8.17	18.68	26.85	46.00	-19.15	peak	
6	476.1665	3.69	20.59	24.28	46.00	-21.72	peak	



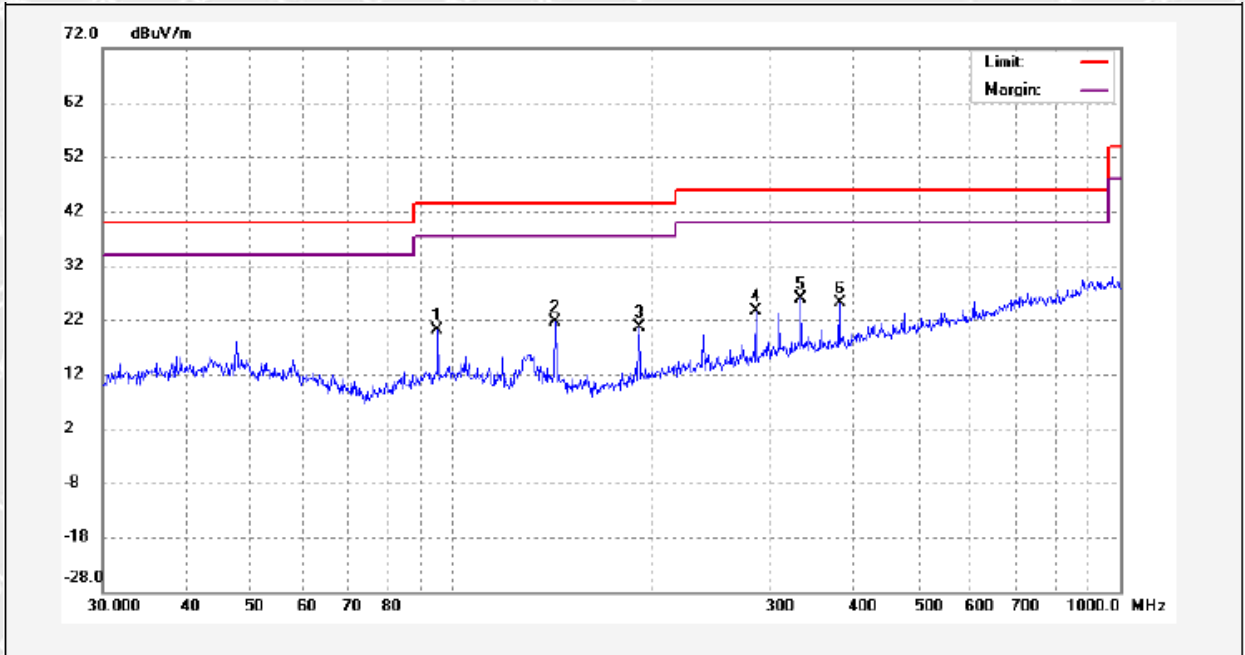
Test Channel High Channel Polarization Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	36.0259	9.28	12.54	21.82	40.00	-18.18	peak	
2	47.5917	8.81	13.89	22.70	40.00	-17.30	peak	
3	60.0059	5.86	13.43	19.29	40.00	-20.71	peak	
4	95.2263	21.18	11.58	32.76	43.50	-10.74	peak	
5	142.8243	14.45	11.63	26.08	43.50	-17.42	peak	
6	190.4050	5.04	14.77	19.81	43.50	-23.69	peak	



Test Channel High Channel **Polarization** Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	95.2263	6.38	13.80	20.18	43.50	-23.32	peak	
2	142.8243	10.73	10.91	21.64	43.50	-21.86	peak	
3	190.4050	7.74	12.97	20.71	43.50	-22.79	peak	
4	285.6770	7.43	16.10	23.53	46.00	-22.47	peak	
5	333.2190	8.10	17.89	25.99	46.00	-20.01	peak	
6	380.8478	6.38	18.68	25.06	46.00	-20.94	peak	



Test Frequency: Above 1GHz

Frequency (MHz)	Reading (dB μ V/m)	Detector	Polar (H/V)	Corrected Factor (dB)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Low Channel-2405MHz							
4810	52.31	PK	H	-3.59	48.72	74	-25.28
4810	43.47	AV	H	-3.59	39.88	54	-14.12
7215	42.61	PK	H	3.07	45.68	74	-28.32
7215	33.23	AV	H	3.07	36.3	54	-17.7
4810	53.3	PK	V	-3.46	49.84	74	-24.16
4810	42.78	AV	V	-3.46	39.32	54	-14.68
7215	41.82	PK	V	2.97	44.79	74	-29.21
7215	32.13	AV	V	2.97	35.1	54	-18.9
Middle Channel-2440MHz							
4880	54.36	PK	H	-3.41	50.95	74	-23.05
4880	43.91	AV	H	-3.41	40.5	54	-13.5
7320	42.77	PK	H	3.23	46	74	-28
7320	33.69	AV	H	3.23	36.92	54	-17.08
4880	52.59	PK	V	-3.26	49.33	74	-24.67
4880	43.52	AV	V	-3.26	40.26	54	-13.74
7320	44.37	PK	V	3.13	47.5	74	-26.5
7320	35.18	AV	V	3.13	38.31	54	-15.69
High Channel-2475MHz							
4950	52.6	PK	H	-3.24	49.36	74	-24.64
4950	43.73	AV	H	-3.24	40.49	54	-13.51
7425	43.88	PK	H	3.38	47.26	74	-26.74
7425	34.67	AV	H	3.38	38.05	54	-15.95
4950	52.48	PK	V	-3.06	49.42	74	-24.58
4950	43.52	AV	V	-3.06	40.46	54	-13.54
7425	43.5	PK	V	3.28	46.78	74	-27.22
7425	34.86	AV	V	3.28	38.14	54	-15.86

Note: Testing is carried out with frequency range 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.



6.3 Power Spectral Density

6.3.1 Standard Applicable

According to 15.247(a)(1)(iii), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

6.3.2 Test Procedure

According to the KDB 558074, such specifications require that the same method as used to determine the conducted output power shall also be used to determine the power spectral density. The test method of power spectral density as below:

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- e) Detector = power averaging (RMS) or sample detector (when RMS not available).
- f) Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- g) Sweep time = auto couple.
- h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
- i) Use the peak marker function to determine the maximum amplitude level.
- j) If measured value exceeds limit, reduce RBW (no less than 3kHz) 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).

6.3.3 Test Result

Test Mode	Test Channel	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
OQPSK	Low	4.80	8
	Middle	5.15	8
	High	5.09	8



Low Channel



Middle Channel



High Channel





6.4 6dB Bandwidth

6.4.1 Standard Applicable

According to 15.247(a)(2). 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.

6.4.2 Test Procedure

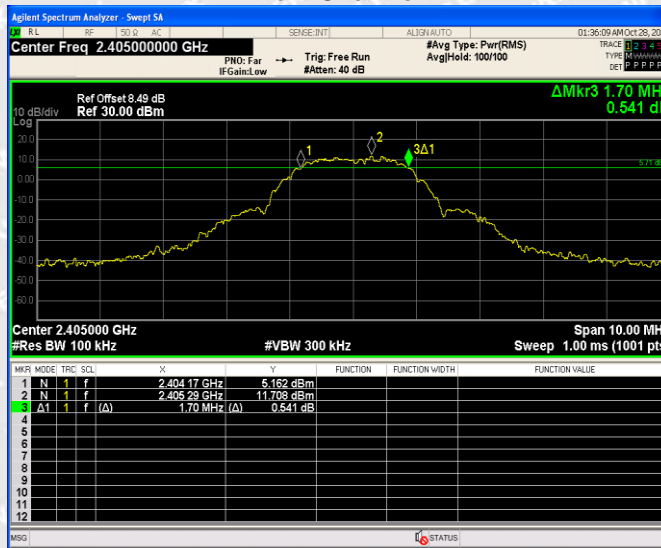
- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two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

6.4.3 Test Result

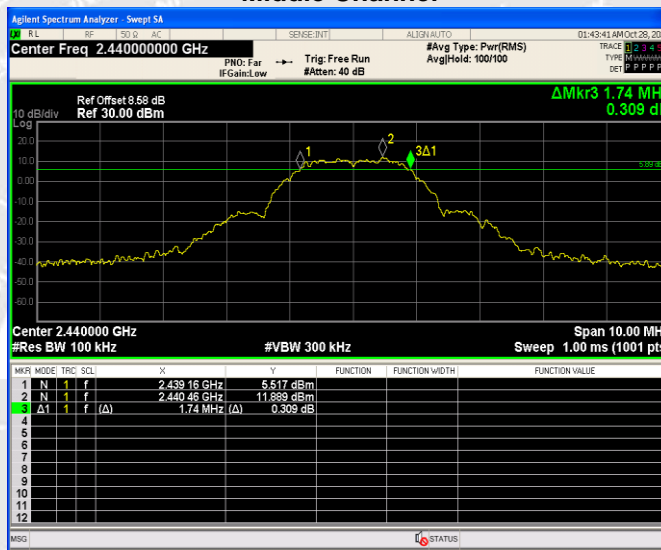
Test Mode	Test Channel	6dB Bandwidth MHz	Limit kHz
OQPSK	Low	1.700	≥ 500
	Middle	1.740	≥ 500
	High	1.690	≥ 500



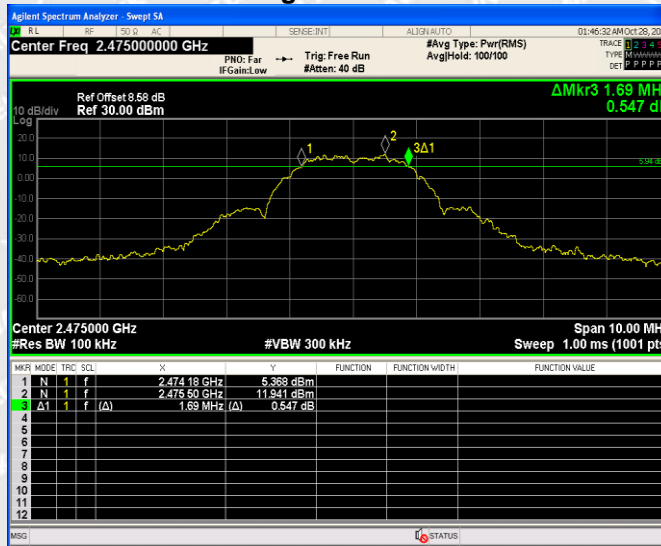
Low Channel



Middle Channel



High Channel





6.5 RF Output Power

6.5.1 Standard Applicable

According to 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.

6.5.2 Test Procedure

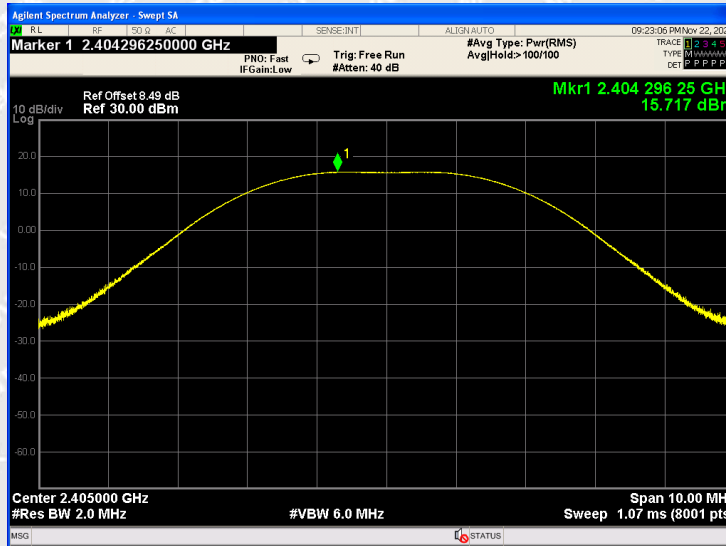
- a) Set the RBW \geq DTS bandwidth.
- b) Set VBW $\geq 3 \times$ RBW.
- c) Set span $\geq 3 \times$ RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

6.5.3 Test Result

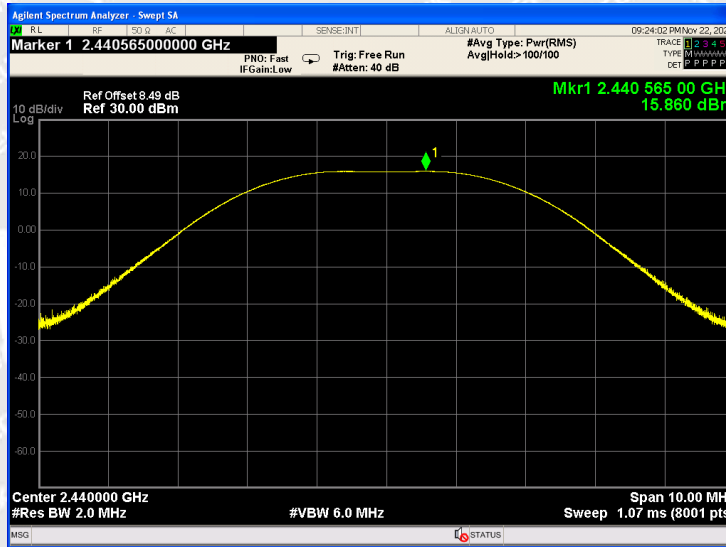
Modulation	Test Channel	Reading (dBm)	Output Power (mW)	Limit (mW)
OQPSK	Low	15.717	37.299	1000
	Middle	15.860	38.548	1000
	High	15.816	38.159	1000



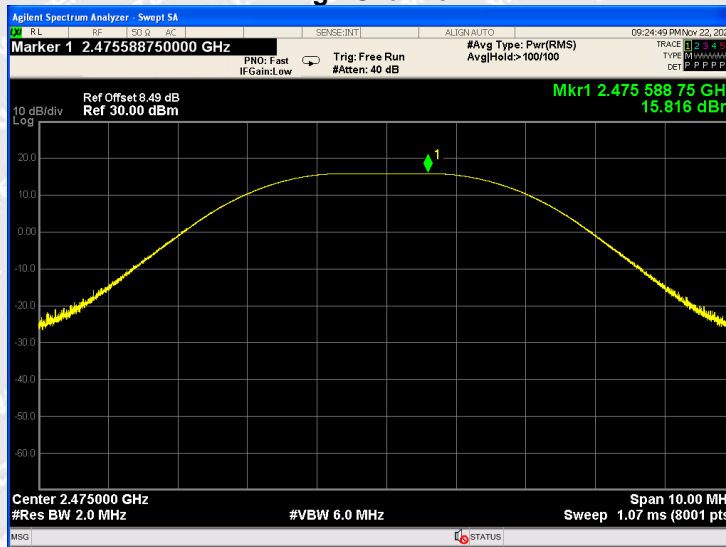
Low Channel



Middle Channel



High Channel





6.6 Out of Band Emissions

6.6.1 Standard Applicable

According to §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).

6.6.2 Test Procedure

According to the KDB 558074, the band-edge radiated test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement.

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 section 8.1.

Report the three highest emissions relative to the limit.

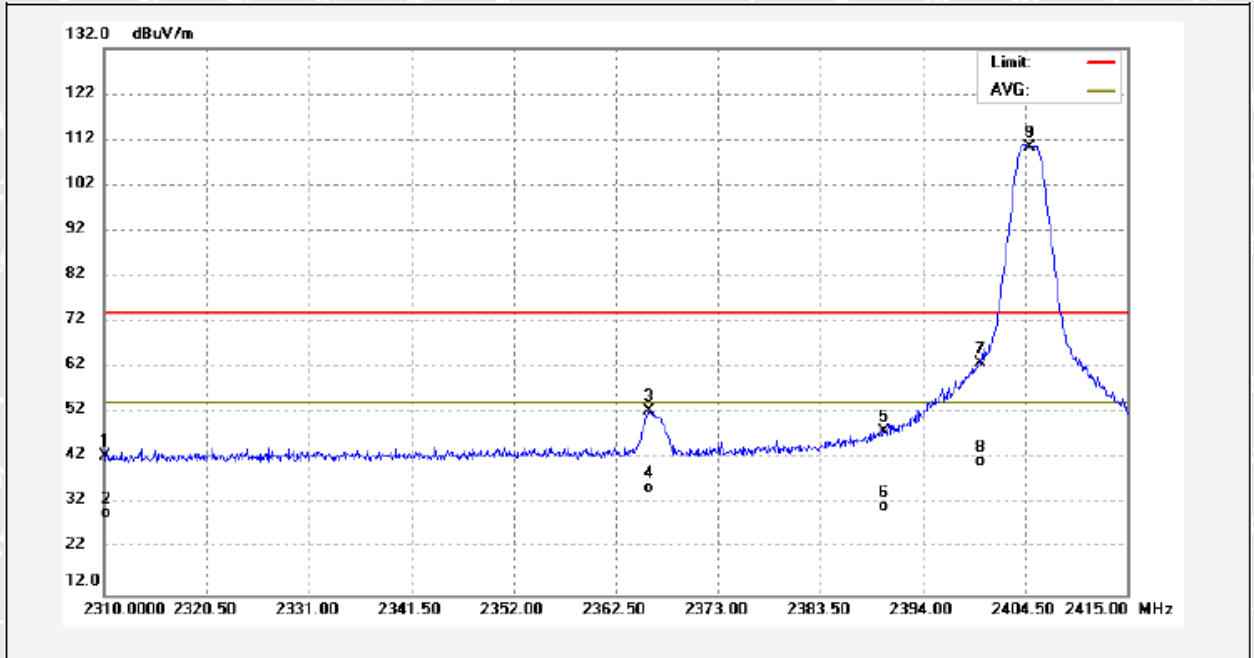


6.6.3 Test Result

Radiated Test

Test Channel Low Channel

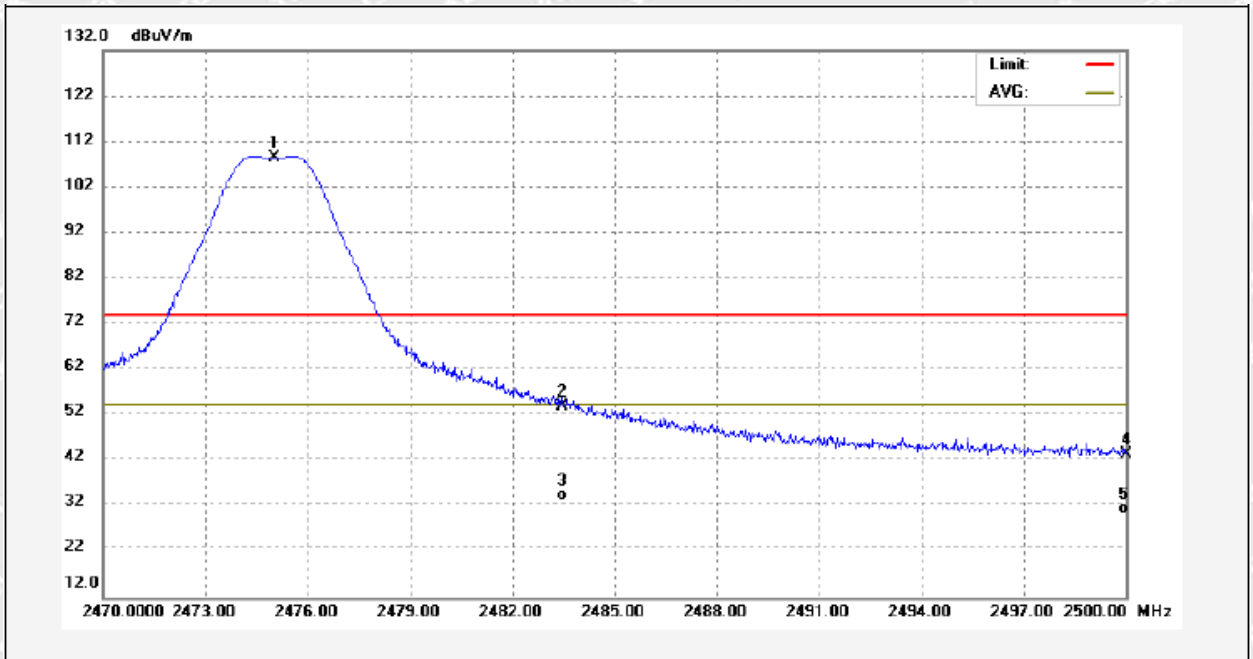
Polarization Vertical (worst case)



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2310.000	10.25	32.11	42.36	74.00	-31.64	peak	
2	2310.000	-2.20	32.11	29.91	54.00	-24.09	AVG	
3	2365.954	19.86	32.36	52.22	74.00	-21.78	peak	
4	2365.954	3.31	32.36	35.67	54.00	-18.33	AVG	
5	2390.000	15.37	32.47	47.84	74.00	-26.16	peak	
6	2390.000	-1.18	32.47	31.29	54.00	-22.71	AVG	
7	2400.000	30.44	32.51	62.95	74.00	-11.05	peak	
8	2400.000	8.62	32.51	41.13	54.00	-12.87	AVG	
9	2405.000	77.76	32.53	110.29	74.00	36.29	peak	



Test Channel High Channel **Polarization** Vertical (worst case)

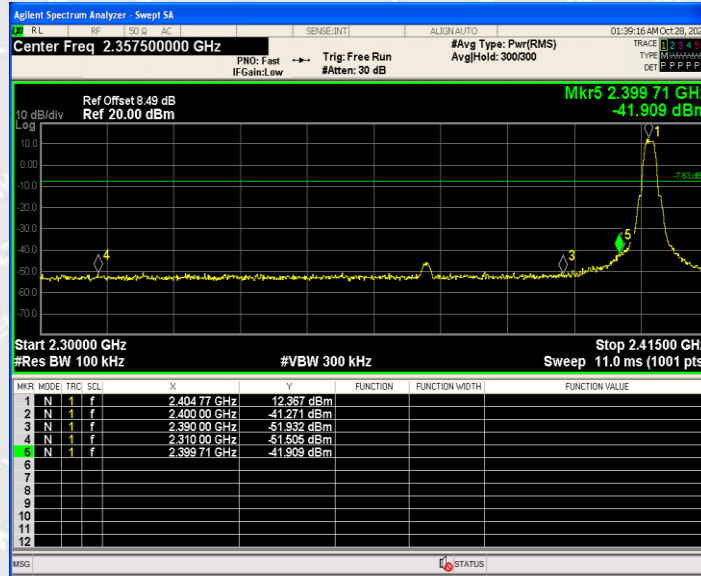


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2475.000	75.47	32.84	108.31	74.00	34.31	peak	
2	2483.500	21.05	32.88	53.93	74.00	-20.07	peak	
3	2483.500	1.52	32.88	34.40	54.00	-19.60	AVG	
4	2500.000	10.55	32.95	43.50	74.00	-30.50	peak	
5	2500.000	-1.70	32.95	31.25	54.00	-22.75	AVG	

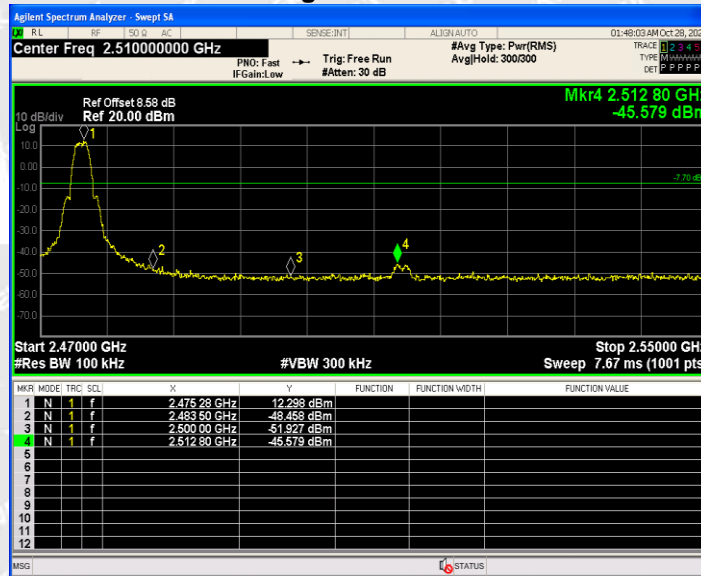


Conducted Test

Low Channel



High Channel





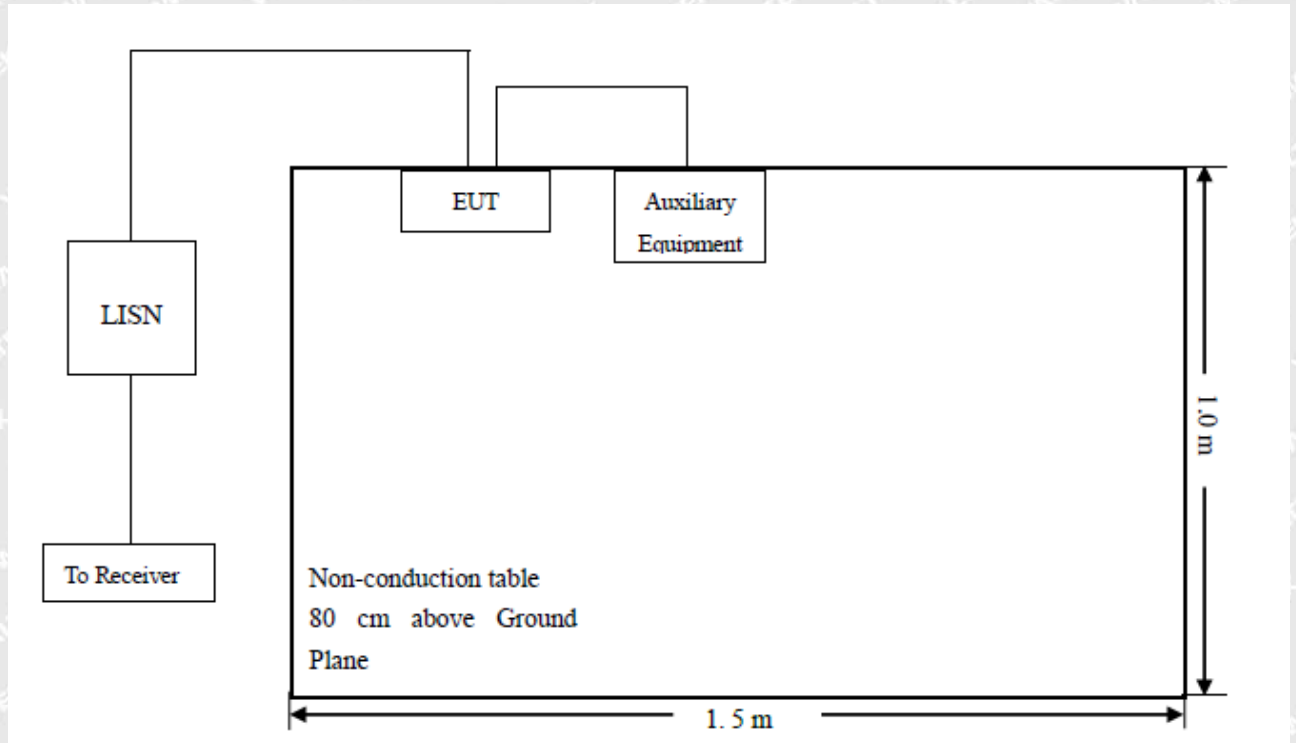
6.7 Conducted Emissions

6.7.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

6.7.2 Basic Test Setup Block Diagram



6.7.3 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency.....	150 kHz
Stop Frequency.....	30 MHz
Sweep Speed.....	Auto
IF Bandwidth.....	10 kHz
Quasi-Peak Adapter Bandwidth.....	9 kHz
Quasi-Peak Adapter Mode.....	Normal



6.7.4 Measurement Description

The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

6.7.5 Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF(Voltage Division Facotr), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Measurement}=\text{Reading Level}+\text{Correct Factor}$$

$$\text{Correct Facotor}=\text{LISN VDF}+\text{Cable Loss}$$

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin}=\text{Measurement}-\text{Limit}$$

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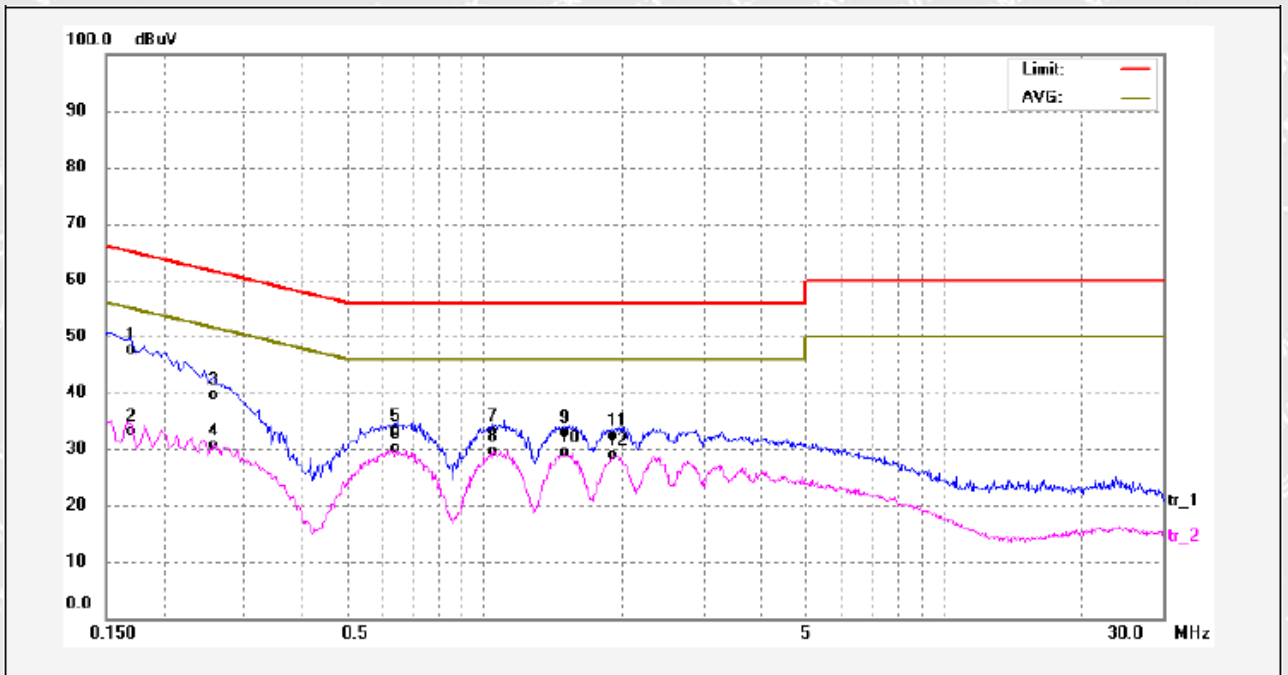
6.7.6 Test Result

Test Mode

Communication mode (AC 120V/60Hz)

Polarity

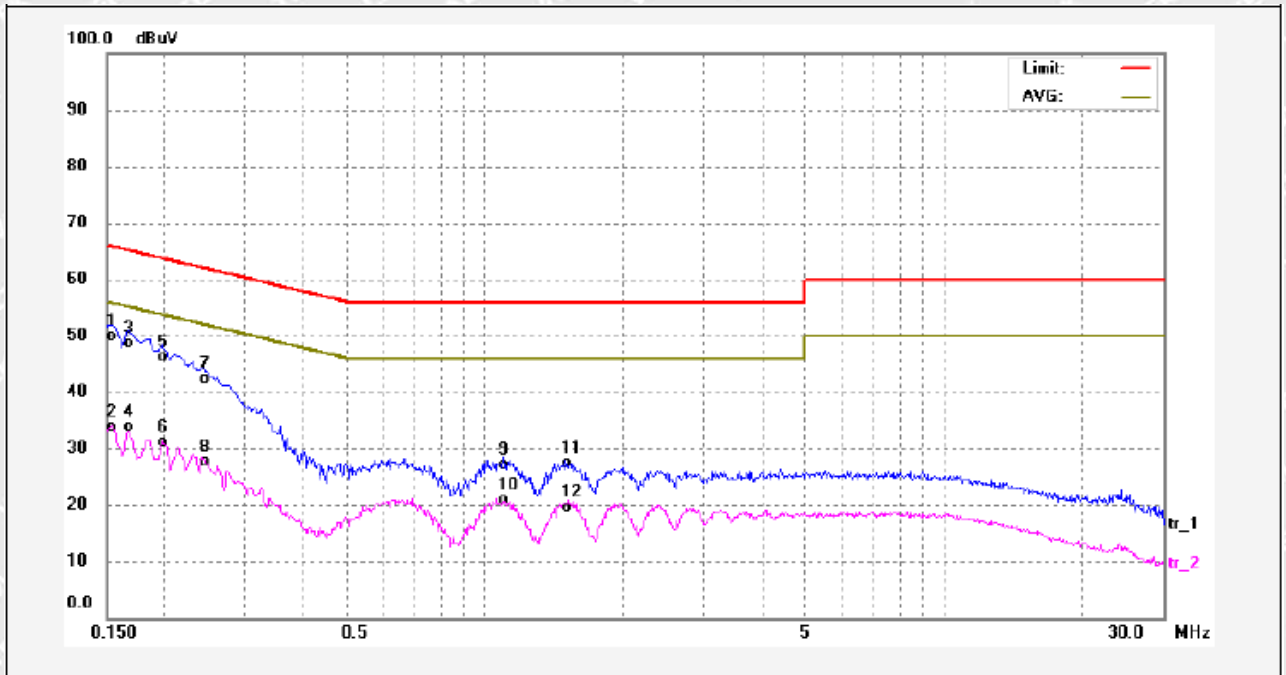
Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1712	37.04	9.65	46.69	64.90	-18.21	QP	
2	0.1712	22.50	9.65	32.15	54.90	-22.75	AVG	
3	0.2562	29.02	9.68	38.70	61.55	-22.85	QP	
4	0.2562	19.93	9.68	29.61	51.55	-21.94	AVG	
5	0.6419	22.53	9.70	32.23	56.00	-23.77	QP	
6	0.6419	19.31	9.70	29.01	46.00	-16.99	AVG	
7	1.0540	22.36	9.71	32.07	56.00	-23.93	QP	
8	1.0540	19.04	9.71	28.75	46.00	-17.25	AVG	
9	1.5100	22.05	9.73	31.78	56.00	-24.22	QP	
10	1.5100	18.63	9.73	28.36	46.00	-17.64	AVG	
11	1.9420	21.51	9.76	31.27	56.00	-24.73	QP	
12	1.9420	18.09	9.76	27.85	46.00	-18.15	AVG	



Test Mode Communication mode (AC 120V/60Hz) **Polarity** Neutral



No.	Freq. (MHz)	Reading (dBUV)	Factor (dB)	Result (dBUV)	Limit dBUV	Margin (dB)	Detector	Remark
1	0.1539	39.35	9.65	49.00	65.78	-16.78	QP	
2	0.1539	23.22	9.65	32.87	55.78	-22.91	AVG	
3	0.1685	38.06	9.65	47.71	65.03	-17.32	QP	
4	0.1685	23.19	9.65	32.84	55.03	-22.19	AVG	
5	0.1986	35.55	9.66	45.21	63.66	-18.45	QP	
6	0.1986	20.36	9.66	30.02	53.66	-23.64	AVG	
7	0.2481	31.60	9.66	41.26	61.82	-20.56	QP	
8	0.2481	16.92	9.66	26.58	51.82	-25.24	AVG	
9	1.0980	16.41	9.74	26.15	56.00	-29.85	QP	
10	1.0980	10.26	9.74	20.00	46.00	-26.00	AVG	
11	1.5020	16.61	9.73	26.34	56.00	-29.66	QP	
12	1.5020	8.96	9.73	18.69	46.00	-27.31	AVG	



7 Photographs Test Setup

7.1 Photographs - Radiated Emission Test Setup

30MHz-1GHz



Above 1GHz





7.2 Photographs – Conducted Emission Test Setup



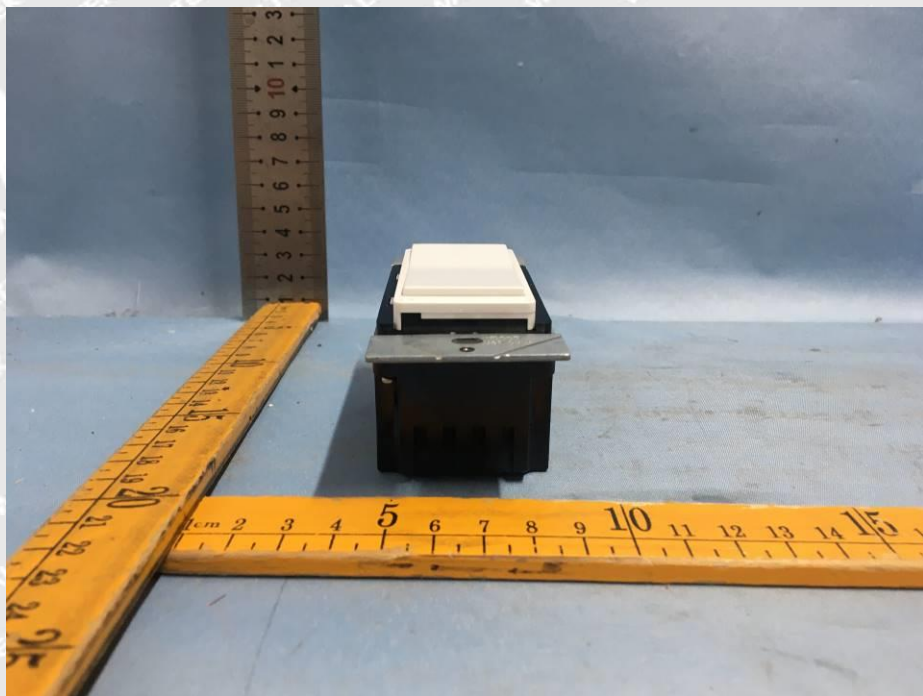
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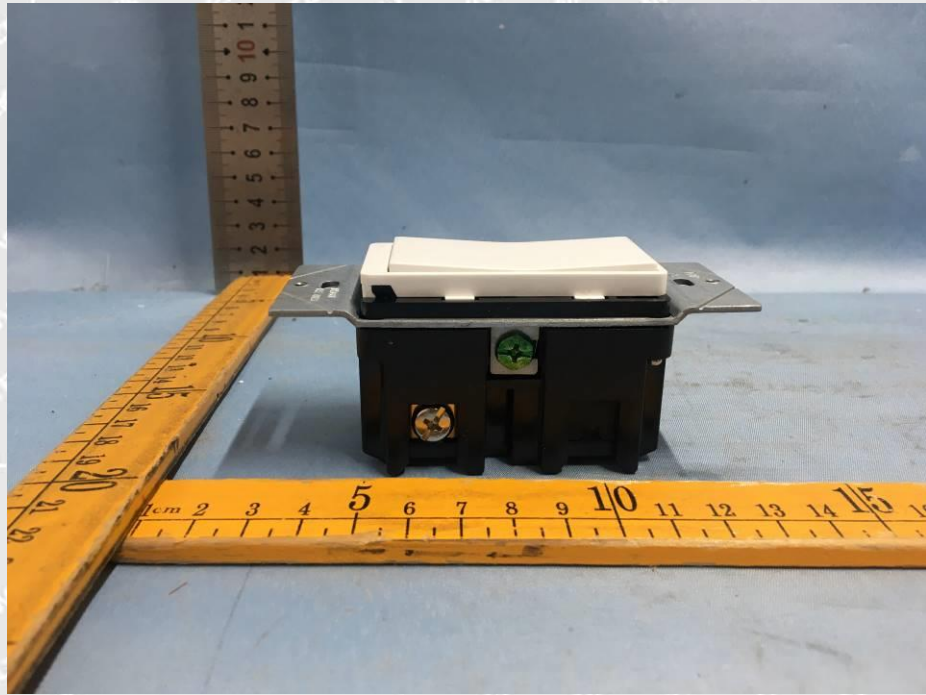


8 Photographs - Constructional Details

8.1 EUT - External Photos

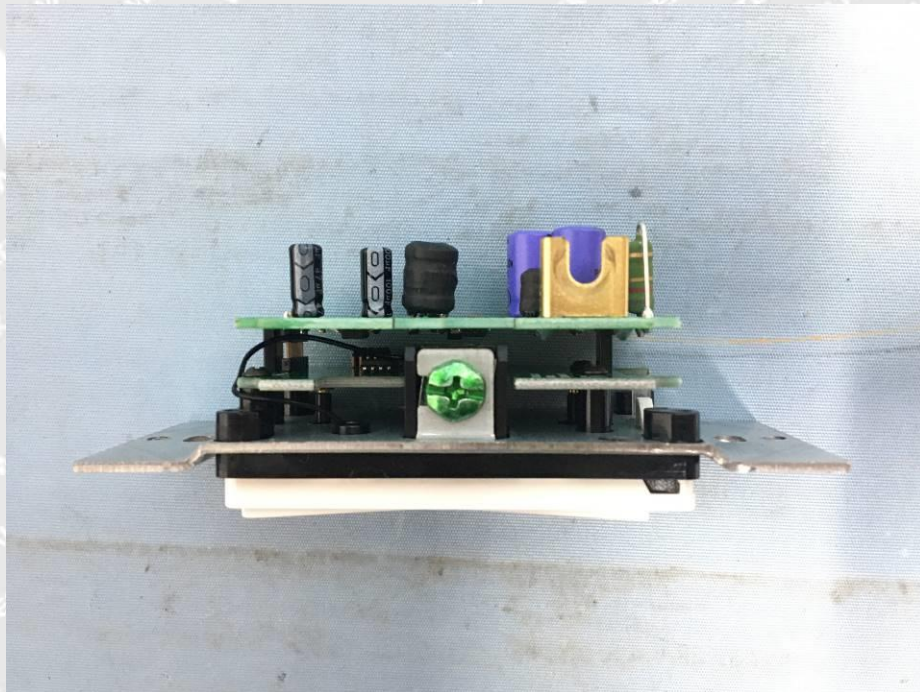


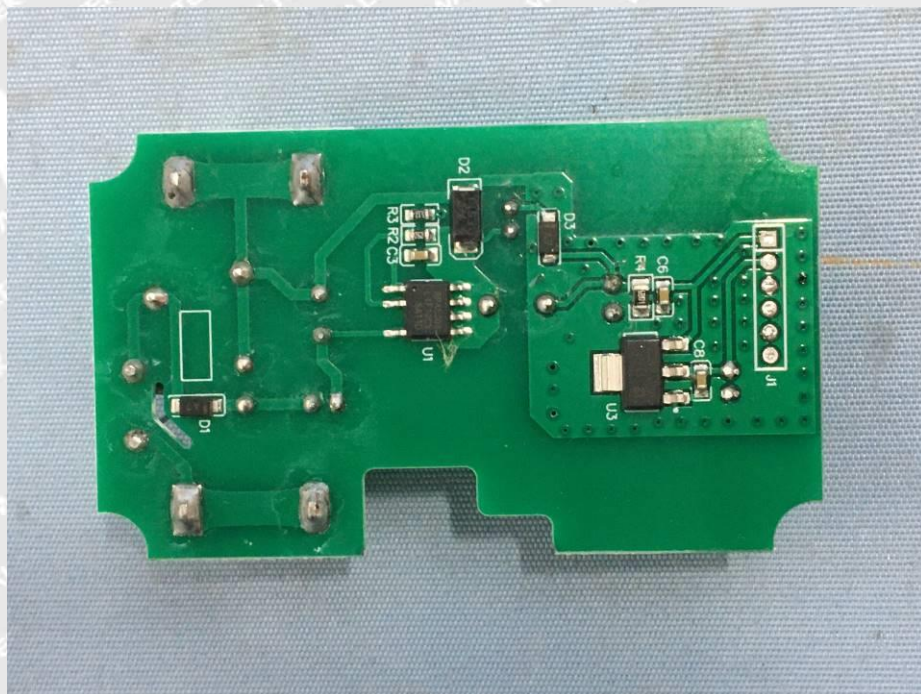
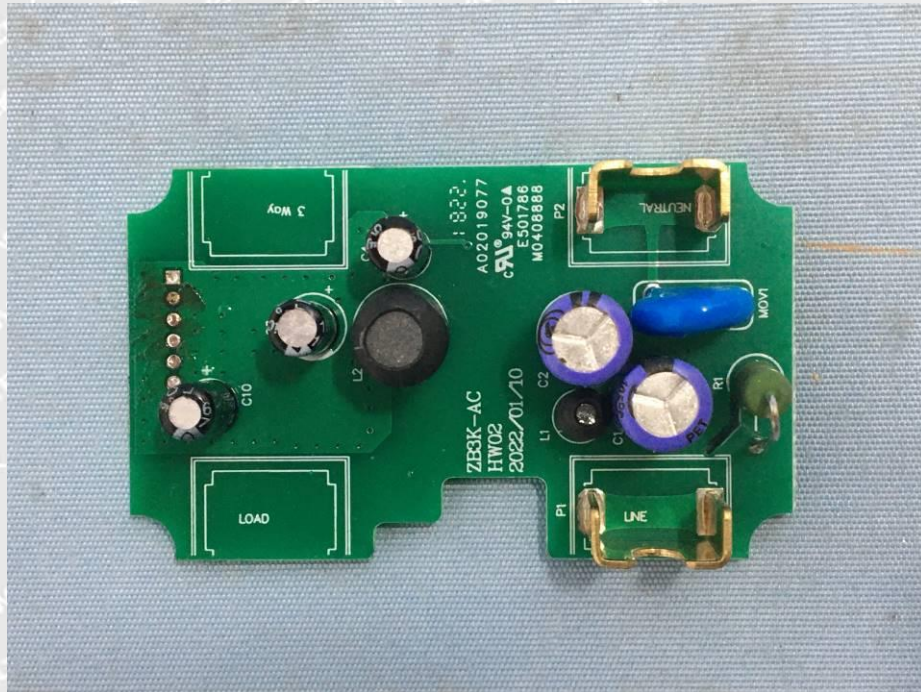


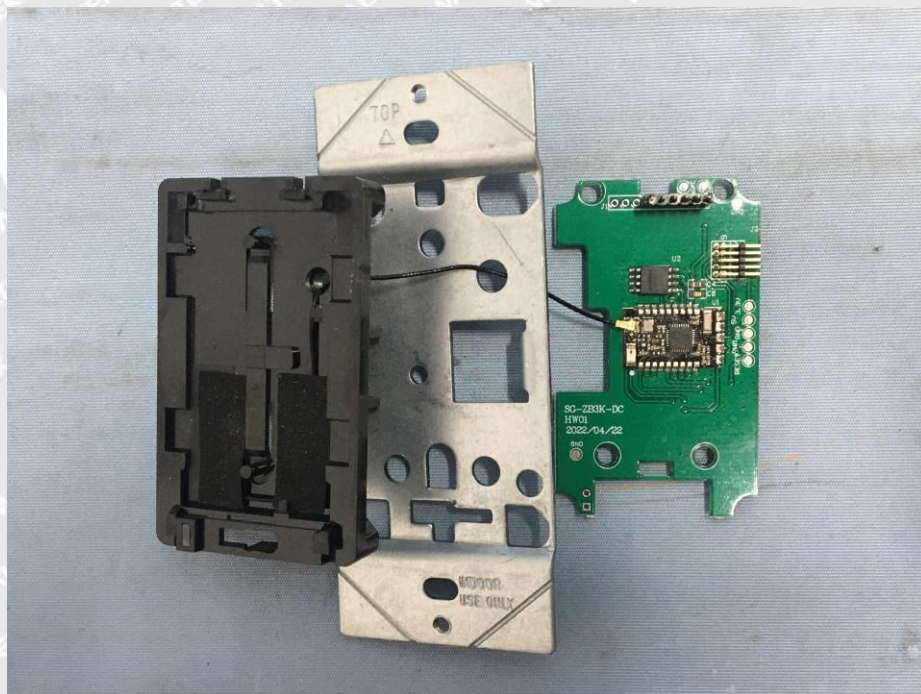
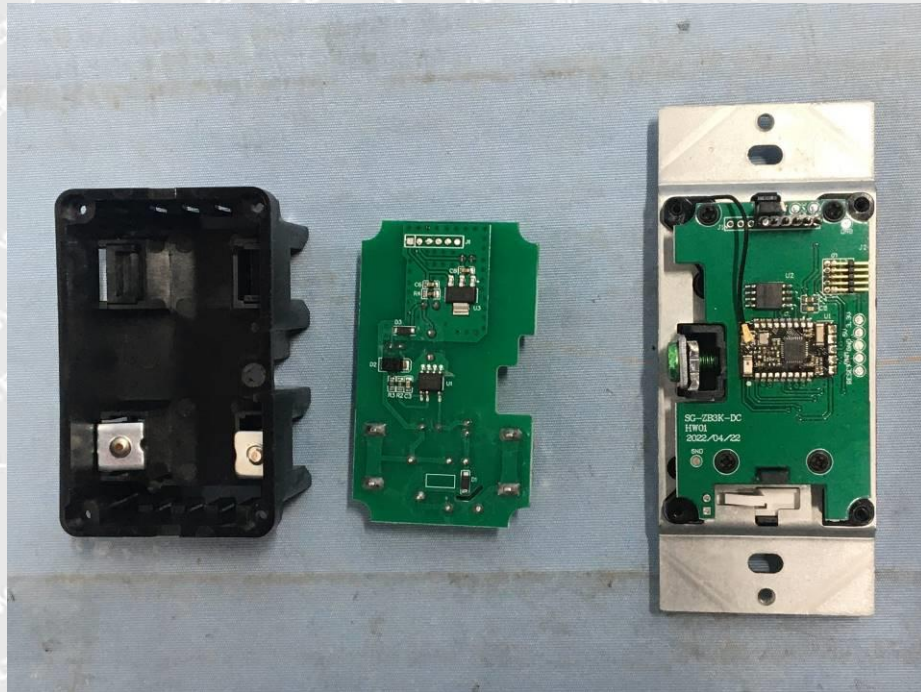


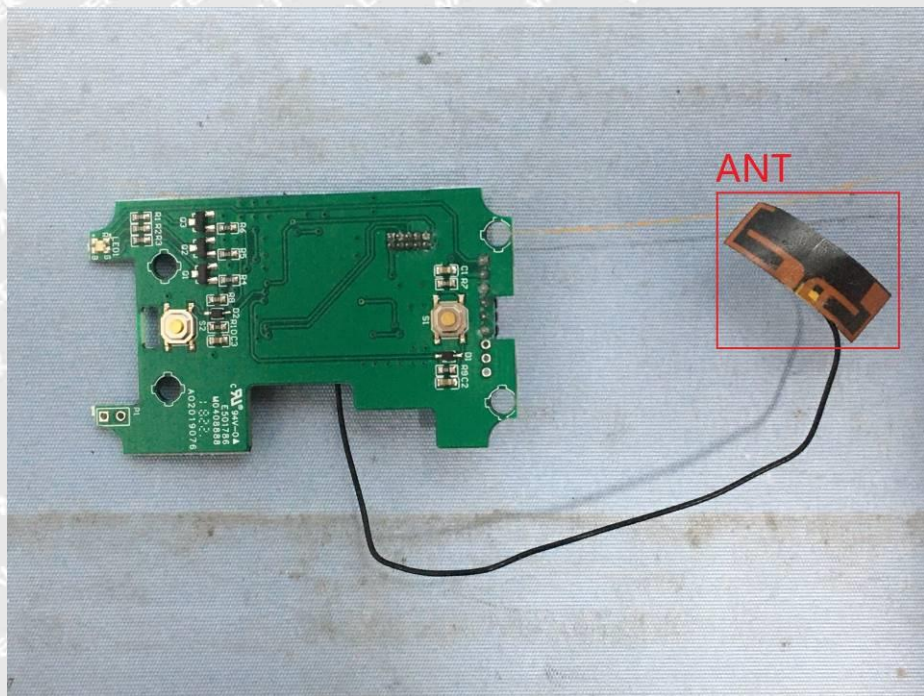
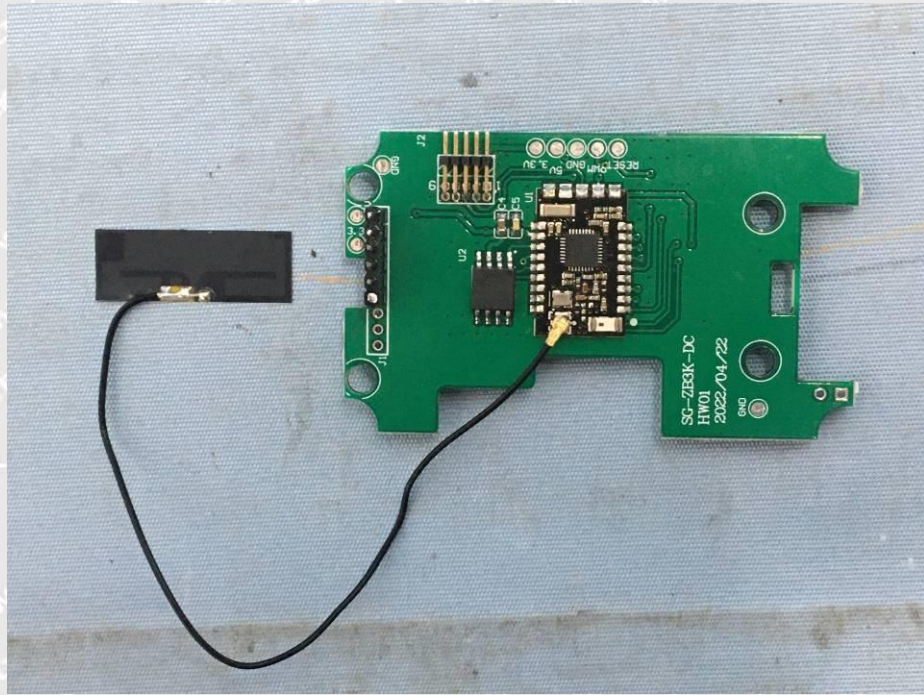


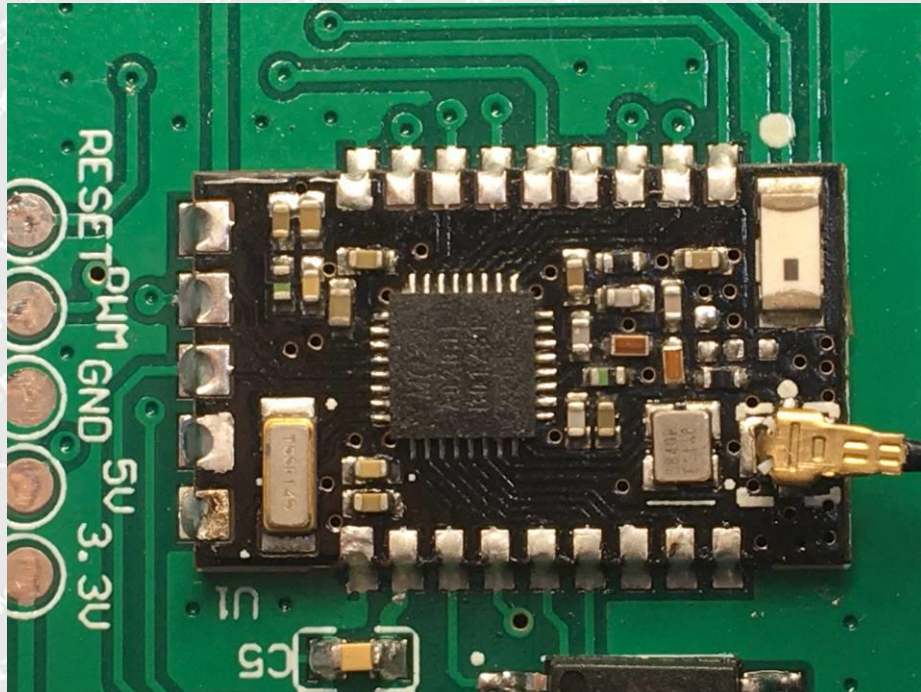
8.2 EUT - Internal Photos











====End of Report====

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