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TEST REPORT

Report No. : CQASZ20190600455E
Applicant: Zhejiang PDW Industrial Co., Ltd
Address of Applicant: Quanxi Industrial Park, Wuyi County, Jinhua City, Zhejiang, P.R. China 321200

Equipment Under Test (EUT):

EUT Name: TPMS Solar Display
Model No.: 04.01.13
Brand Name: PDW
FCC ID: 2ATWD-040113
Standards: 47 CFR Part 15, Subpart B, Class B
Date of Receipt: 2019-06-12
Date of Test: 2019-06-12 to 2019-07-03
Date of Issue: 2019-07-03
Test Result : **PASS***

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

Tested By:

Tiny You

(Tiny You)

Reviewed By:

Aaron Ma

(Aaron Ma)

Approved By:

Jack Ai



1 Version

Revision History of Report

Report No.	Version	Description	Issue Date
CQASZ20190600455E	Rev.01	Initial report	2019-07-03

2 Test Summary

Test Item	Test Requirement	Test method	Result
Radiated Emission	47 CFR Part 15B	ANSI C63.4-2014	PASS
Conducted Emission (150KHz to 30MHz)	47 CFR Part 15B	ANSI C63.4-2014	PASS

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement Range (MHz)
Below 1.705	30
1.705 to 108	1000
108 to 500	2000
500 to 1000	5000
Above 1000	5th harmonic of the highest frequency or 40GHz, whichever is lower

Remark:

The highest frequency of the internal sources of the EUT is 433.92MHz.

3 Contents

	Page
1 VERSION	2
2 TEST SUMMARY	3
3 CONTENTS	4
4 GENERAL INFORMATION	5
4.1 CLIENT INFORMATION	5
4.2 GENERAL DESCRIPTION OF EUT	5
4.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD	5
4.4 TEST ENVIRONMENT	6
4.5 DESCRIPTION OF SUPPORT UNITS	6
4.6 TEST LOCATION	6
4.7 DEVIATION FROM STANDARDS	6
4.8 ABNORMALITIES FROM STANDARD CONDITIONS	7
4.9 OTHER INFORMATION REQUESTED BY THE CUSTOMER	7
4.10 MEASUREMENT UNCERTAINTY (95% CONFIDENCE LEVELS, K=2)	7
5 EQUIPMENT LIST	8
6 TEST RESULTS AND MEASUREMENT DATA	9
6.1 CONDUCTED EMISSIONS	9
6.2 RADIATED EMISSION	13
APPENDIX 1 PHOTOGRAPHS OF TEST SETUP	19
APPENDIX 2 PHOTOGRAPHS OF EUT	21

4 General Information

4.1 Client Information

Applicant:	Zhejiang PDW Industrial Co., Ltd
Address of Applicant:	Quanxi Industrial Park, Wuyi County, Jinhua City, Zhejiang, P.R. China 321200
Manufacturer:	Zhejiang PDW Industrial Co., Ltd
Address of Manufacturer:	Quanxi Industrial Park, Wuyi County, Jinhua City, Zhejiang, P.R. China 321200

4.2 General Description of EUT

Product Name:	TPMS Solar Display
Mode No.(EUT):	04.01.13
Brand Name:	Solar Display
EUT Supports Radios application	Receive: 433.92MHz
Hardware version:	V2
Software version:	8.9
Power Supply:	DC3.7V, Chargr by DC4.8~5.2V

4.3 Product Specification subjective to this standard

Frequency Range:	Receive: 433.92MHz
Sample Type:	Portable production
Country of Origin:	China
Country of Destination:	USA
Test voltage:	120V 60Hz

4.4 Test Environment

Operating Environment:	
Radiated Emission	
Temperature:	24.8 °C
Humidity:	54 % RH
Atmospheric Pressure:	1001 mbar
Conducted Emission	
Temperature:	24.0 °C
Humidity:	53 % RH
Atmospheric Pressure:	1001 mbar

4.5 Description of Support Units

The EUT has been tested with associated equipment below.

1) support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
Adapter	Auzone	TDHU10E-050150	DOC	Client

2) cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
1	USB cable	-	Unshielded (0.8m)	CQA

4.6 Test Location

All tests were performed at:

Shenzhen Huaxia Testing Technology Co., Ltd.,

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

No tests were sub-contracted:

4.7 Deviation from Standards

None.

4.8 Abnormalities from Standard Conditions

None.

4.9 Other Information Requested by the Customer

None.

4.10 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Conduction emission	3.74dB (9kHz to 150kHz)
		3.34dB (150kHz to 30MHz)
2	Radiated emission	5.12dB (Below 1GHz)
		4.60dB (Above 1GHz)
3	Temperature	0.8°C
4	Humidity	2.0%

5 Equipment List

Conducted Emissions (150kHz-30MHz)					
Equipment	Manufacturer	Model No	Inventory No.	Cal Date	Cal Due Date
EMI Test Receiver	R&S	ESPI3	CQA-013	2018/9/26	2019/9/25
LISN	R&S	ENV216	CQA-003	2018/11/5	2019/11/4
Coaxial cable (9KHz~300MHz)	CQA	N/A	C009	2018/9/26	2019/9/25

Radiated Emissions					
Equipment	Manufacturer	Model No	Inventory No.	Cal Date	Cal Due Date
Horn Antenna	R&S	HF906	CQA-012	2018/9/26	2019/9/25
Bilog Antenna	R&S	HL562	CQA-011	2018/9/26	2019/9/25
Loop antenna	Schwarzbeck	FMZB1516	CQA-060	2018/10/28	2020/10/27
EMI Test Receiver	R&S	ESR7	CQA-005	2018/10/28	2019/10/27
Spectrum analyzer	R&S	FSV40	CQA-075	2019/6/11	2020/6/10
Preamplifier	MITEQ	AFS4- 00010300- 18-10P-4	CQA-035	2018/9/26	2019/9/25
Preamplifier	MITEQ	AMF-6D- 02001800- 29-20P	CQA-036	2018/11/2	2019/11/1
Coaxial cable (1GHz~40GHz)	CQA	N/A	C019	2018/9/26	2019/9/25
Coaxial cable (9KHz~1GHz)	CQA	N/A	C020	2018/9/26	2019/9/25

6 Test results and Measurement Data

6.1 Conducted Emissions

Test Requirement: 47 CFR Part 15B

Test Method: ANSI C63.4

Test frequency range: 150kHz to 30MHz

Limit:

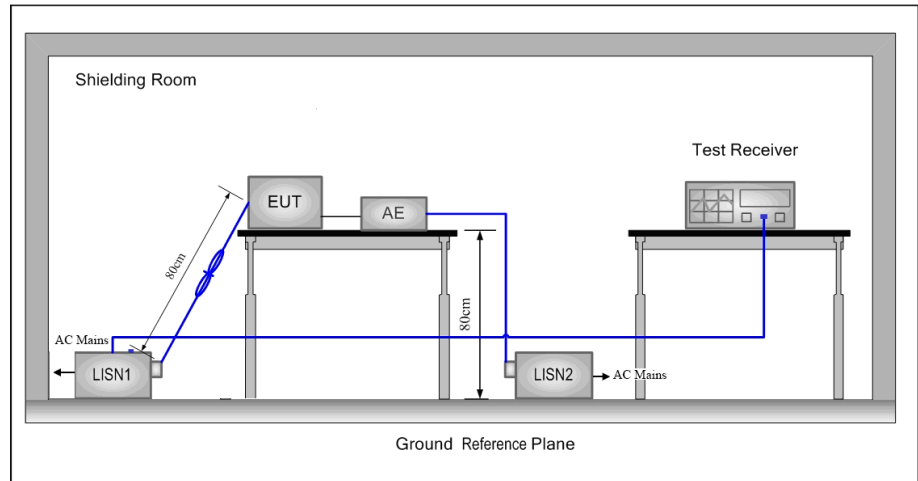
Frequency range (MHz)	Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Procedure:

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 on conducted measurement.

Test Setup:



Instruments Used:

Refer to section 5 for details

Test Mode:

Charging+ 433.92MHz receiver mode,

Test Results:

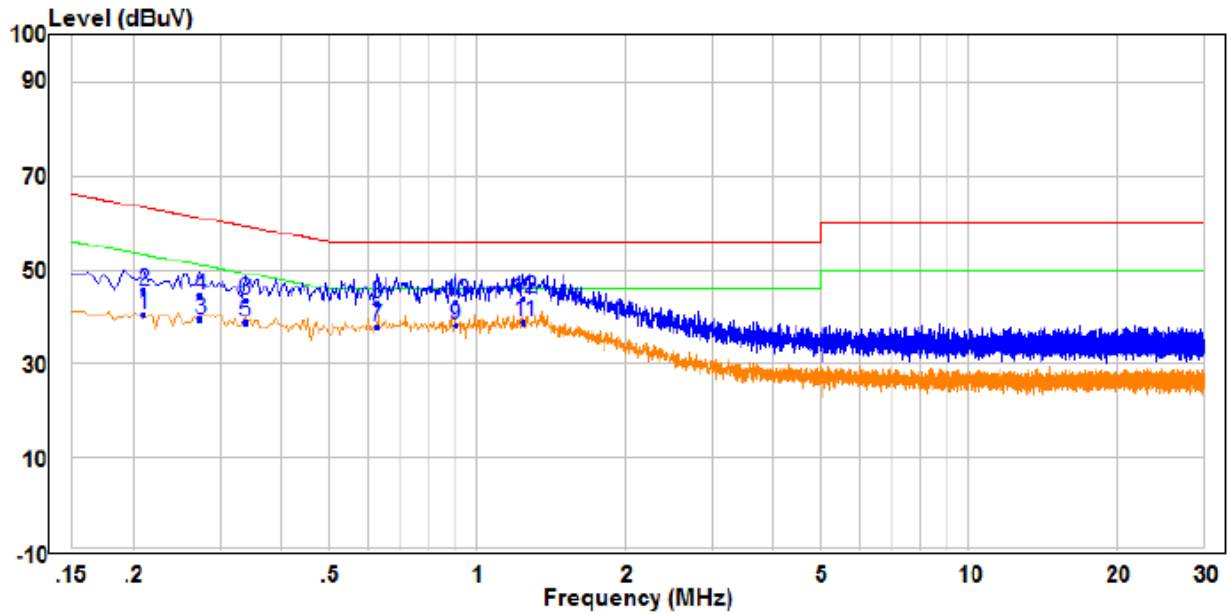
Pass

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

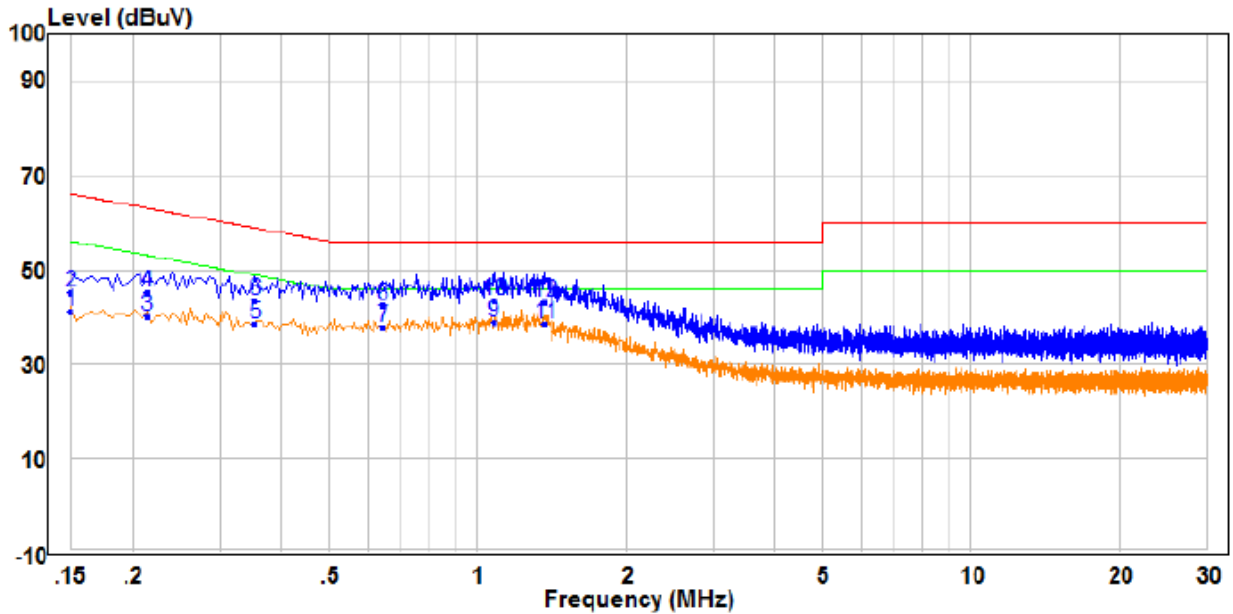
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:



	Read	Limit	Over				
	Freq	Level	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.210	30.94	9.49	40.43	53.21	-12.78	Average
2	0.210	35.94	9.49	45.43	63.21	-17.78	QP
3	0.274	30.06	9.49	39.55	51.00	-11.45	Average
4	0.274	35.18	9.49	44.67	61.00	-16.33	QP
5	0.338	29.31	9.50	38.81	49.25	-10.44	Average
6	0.338	34.08	9.50	43.58	59.25	-15.67	QP
7	0.626	28.08	9.75	37.83	46.00	-8.17	Average
8	0.626	33.00	9.75	42.75	56.00	-13.25	QP
9	0.906	28.51	9.63	38.14	46.00	-7.86	Average
10	0.906	33.39	9.63	43.02	56.00	-12.98	QP
11 PP	1.246	29.45	9.52	38.97	46.00	-7.03	Average
12 QP	1.246	34.21	9.52	43.73	56.00	-12.27	QP

Neutral Line:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.150	31.80	9.48	41.28	56.00	-14.72	Average
2	0.150	35.84	9.48	45.32	66.00	-20.68	QP
3	0.214	30.73	9.48	40.21	53.05	-12.84	Average
4	0.214	35.67	9.48	45.15	63.05	-17.90	QP
5	0.354	28.90	9.52	38.42	48.87	-10.45	Average
6	0.354	33.88	9.52	43.40	58.87	-15.47	QP
7	0.642	28.02	9.76	37.78	46.00	-8.22	Average
8	0.642	32.91	9.76	42.67	56.00	-13.33	QP
9	PP	1.078	9.71	38.90	46.00	-7.10	Average
10	QP	1.078	9.71	43.49	56.00	-12.51	QP
11	1.370	28.80	9.72	38.52	46.00	-7.48	Average
12	1.370	33.43	9.72	43.15	56.00	-12.85	QP

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:
2. Final Test Level = Receiver Reading + LISN Factor + Cable Loss.

6.2 Radiated Emission

Test Requirement: 47 CFR Part 15B
Test Method: ANSI C63.4
Test site: Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	100kHz	300kHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value

Limit:

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

Test Procedure:

Below 1GHz test procedure as below:

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- g. Different from above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber (Above 18GHz the distance is 1 meter).
- h. Repeat above procedures until all frequencies measured was complete.

Test Setup:

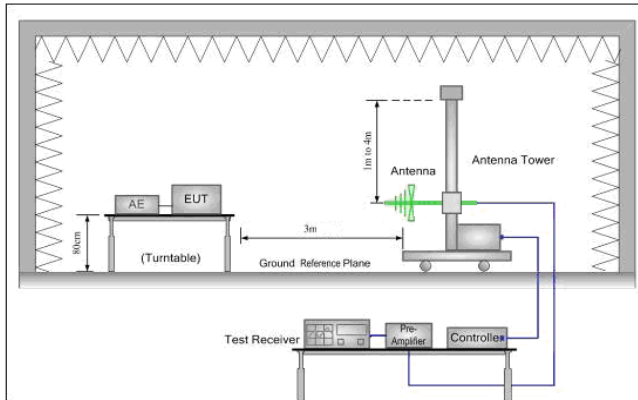


Figure 1. 30MHz to 1GHz

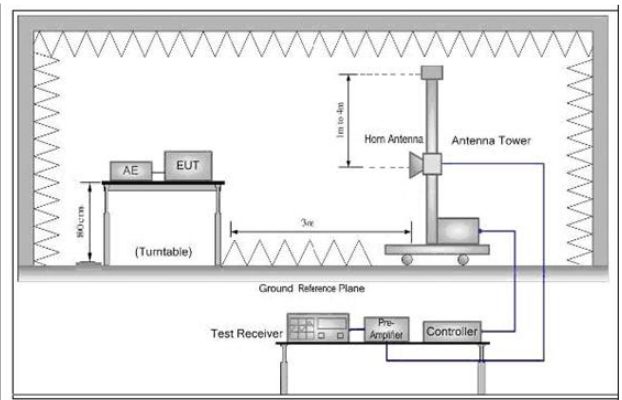
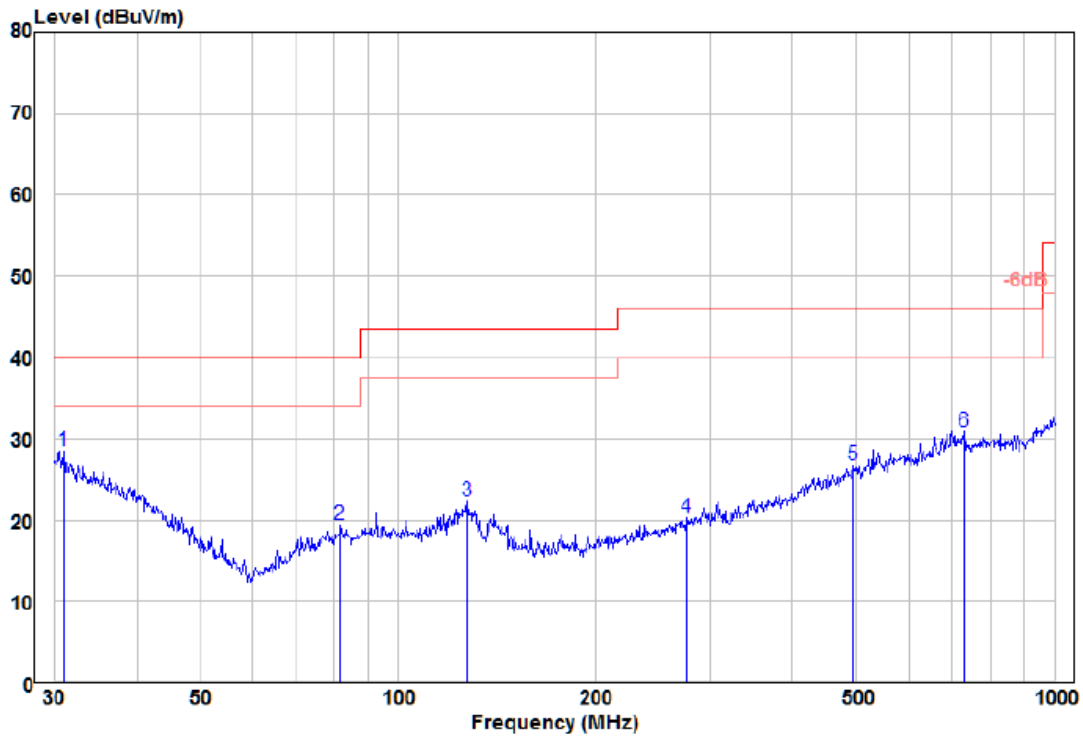


Figure 2. Above 1 GHz

Instruments Used: Refer to section 5 for details
Test Mode: Charging+ 433.92MHz receiver mode,
Test Results: Pass

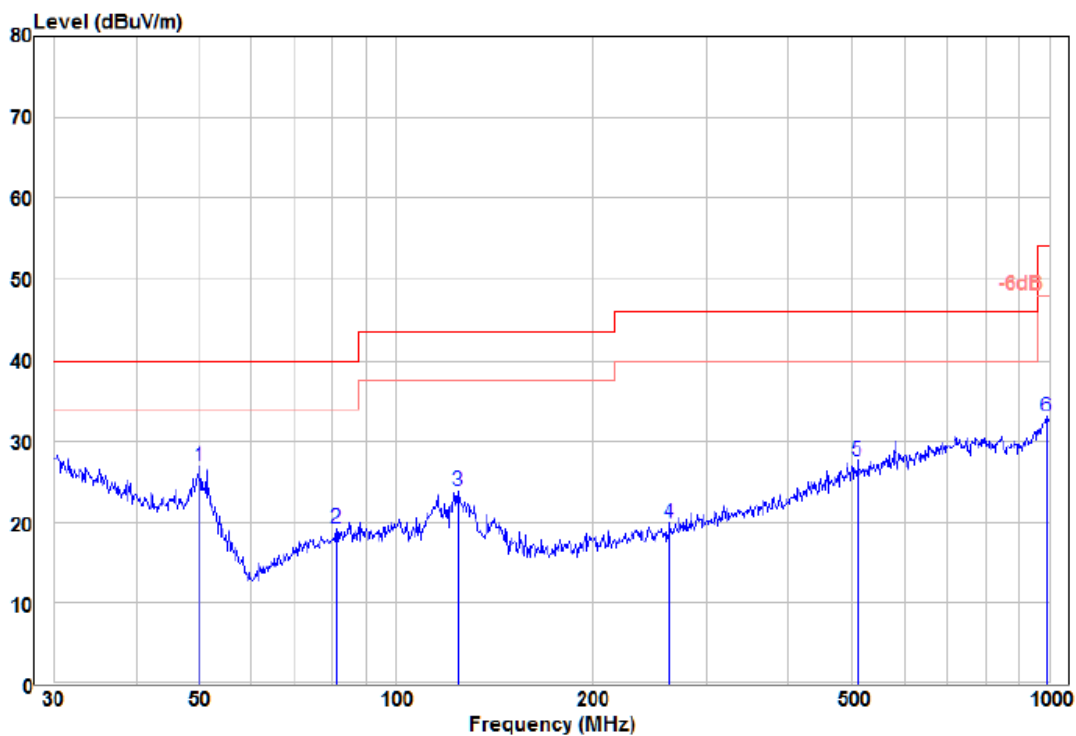
Below 1GHz

Horizontal



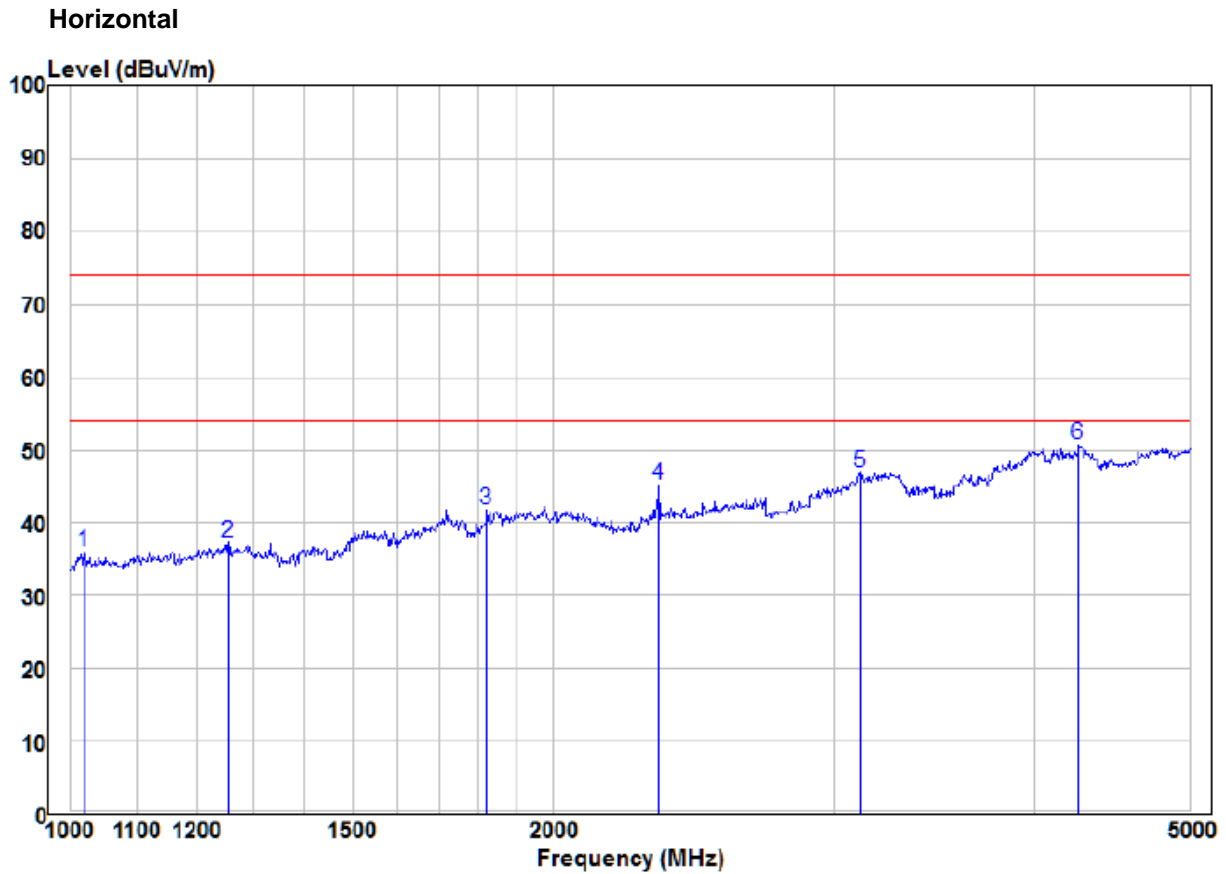
	Read			Limit	Over			
	Freq	Level	Factor	Level	Line	Limit	Remark	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Pol/Phase	
1	pp	30.96	0.54	27.96	28.50	40.00	-11.50 Peak	HORIZONTAL
2		81.78	-0.35	19.73	19.38	40.00	-20.62 Peak	HORIZONTAL
3		127.66	2.02	20.31	22.33	43.50	-21.17 Peak	HORIZONTAL
4		275.16	-0.45	20.82	20.37	46.00	-25.63 Peak	HORIZONTAL
5		494.20	-0.30	27.05	26.75	46.00	-19.25 Peak	HORIZONTAL
6		729.36	0.60	30.22	30.82	46.00	-15.18 Peak	HORIZONTAL

Vertical

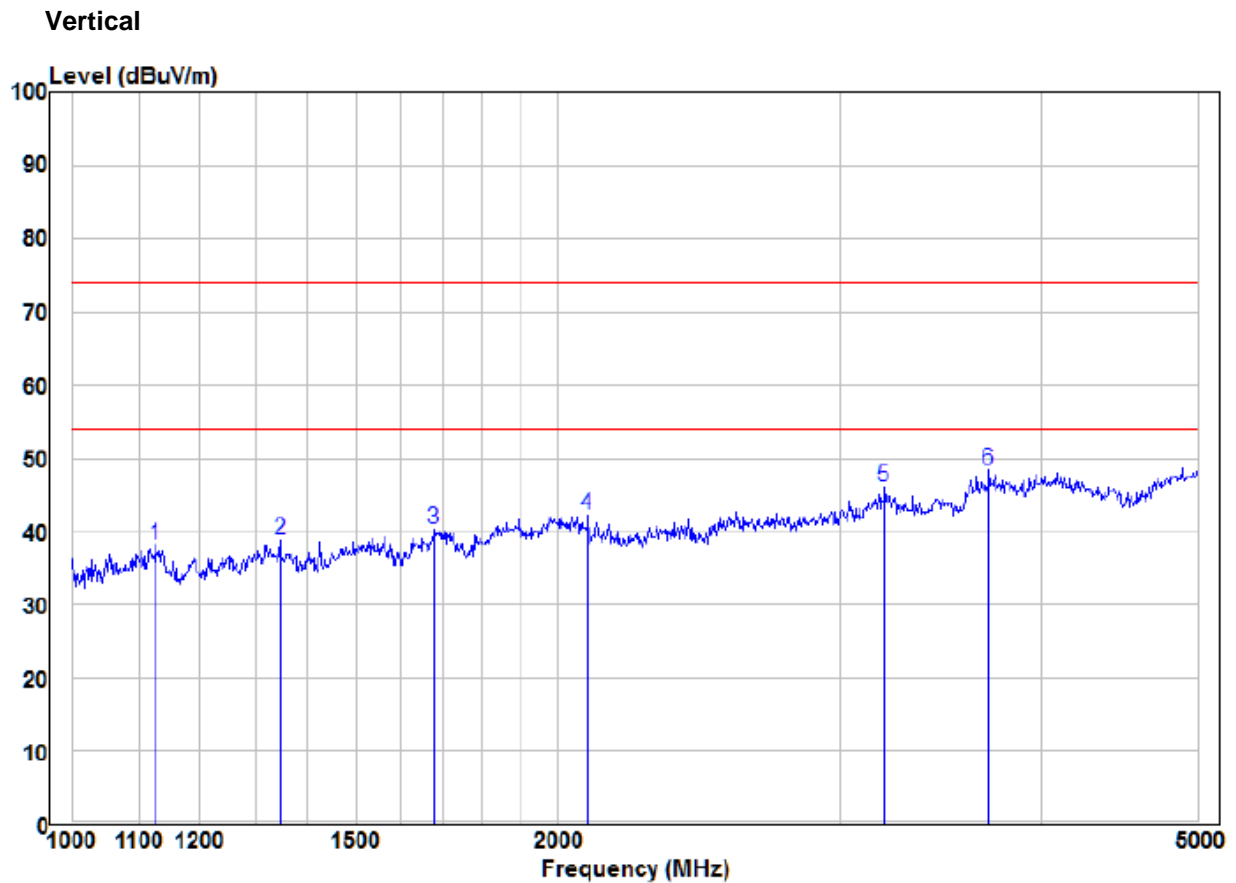


	Read			Limit	Over			
	Freq	Level	Factor	Level	Line	Limit	Remark	
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Pol/Phase	
1	pp	50.23	8.06	18.89	26.95	40.00	-13.05 Peak	VERTICAL
2		81.21	-0.36	19.71	19.35	40.00	-20.65 Peak	VERTICAL
3		124.57	3.41	20.43	23.84	43.50	-19.66 Peak	VERTICAL
4		262.90	-0.39	20.42	20.03	46.00	-25.97 Peak	VERTICAL
5		510.04	0.25	27.33	27.58	46.00	-18.42 Peak	VERTICAL
6		993.01	0.19	32.88	33.07	54.00	-20.93 Peak	VERTICAL

Above 1GHz



	Read	Limit	Over					
Freq	Level	Factor	Level	Line	Limit	Remark	Pol/Phase	
MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB			
1	1019.50	51.37	-15.31	36.06	74.00	-37.94	Peak	HORIZONTAL
2	1254.74	52.46	-15.07	37.39	74.00	-36.61	Peak	HORIZONTAL
3	1819.77	51.41	-9.58	41.83	74.00	-32.17	Peak	HORIZONTAL
4	2331.62	54.47	-9.21	45.26	74.00	-28.74	Peak	HORIZONTAL
5	3115.11	52.51	-5.68	46.83	74.00	-27.17	Peak	HORIZONTAL
6 pp	4263.56	52.86	-2.15	50.71	74.00	-23.29	Peak	HORIZONTAL



	Read Freq	Read Level	Factor	Limit Level	Over Limit	Remark	Pol/Phase
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	1126.48	53.94	-15.82	38.12	74.00	-35.88 Peak	VERTICAL
2	1346.82	53.31	-14.52	38.79	74.00	-35.21 Peak	VERTICAL
3	1679.07	51.80	-11.59	40.21	74.00	-33.79 Peak	VERTICAL
4	2089.91	50.60	-8.45	42.15	74.00	-31.85 Peak	VERTICAL
5	3196.37	51.03	-5.05	45.98	74.00	-28.02 Peak	VERTICAL
6 pp	3712.45	51.27	-2.92	48.35	74.00	-25.65 Peak	VERTICAL

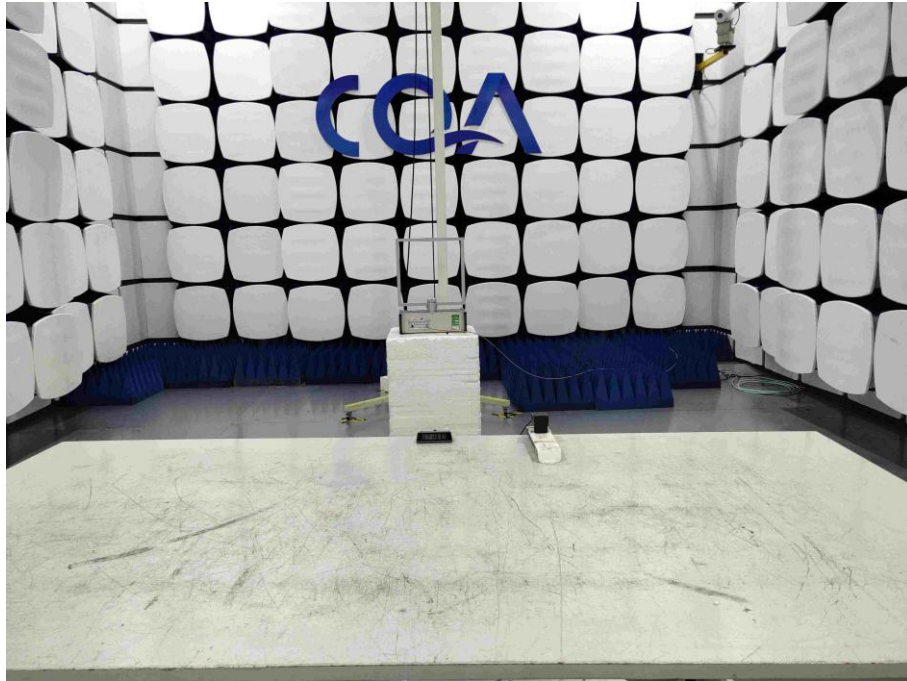
Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
 $Final\ Test\ Level = Receiver\ Reading - Correct\ Factor$
 $Correct\ Factor = Preamplifier\ Factor - Antenna\ Factor - Cable\ Factor$
- 2) Scan from 9kHz to 25GHz, the disturbance above 13GHz and below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Test Model No.: 04.01.13

Radiated emission Test Setup-1(9kHz~30MHz)



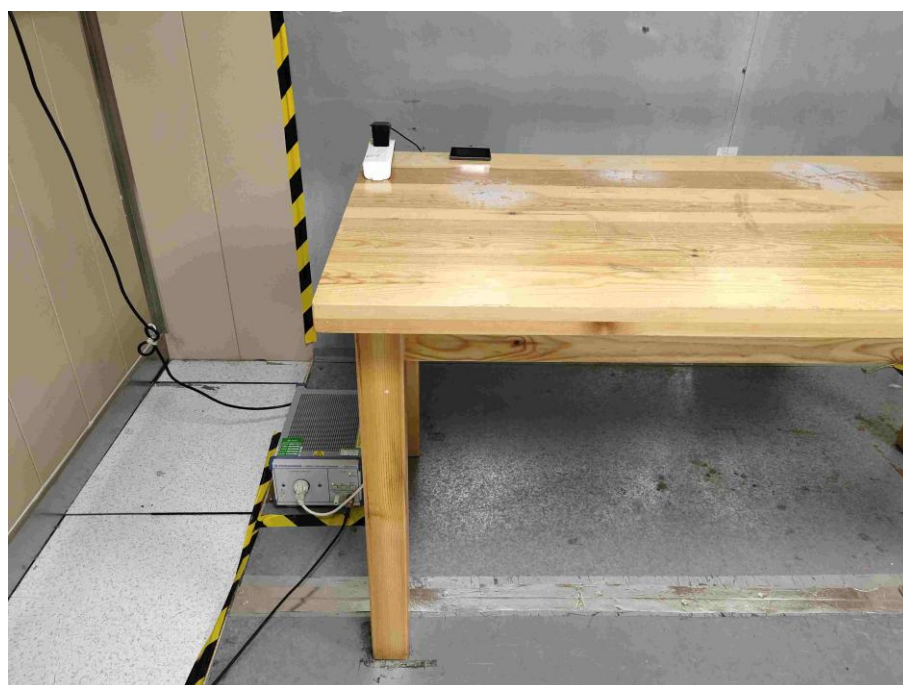
Radiated emission Test Setup-2 (30MHz~1GHz)



Radiated spurious emission Test Setup-3(Above 1GHz)

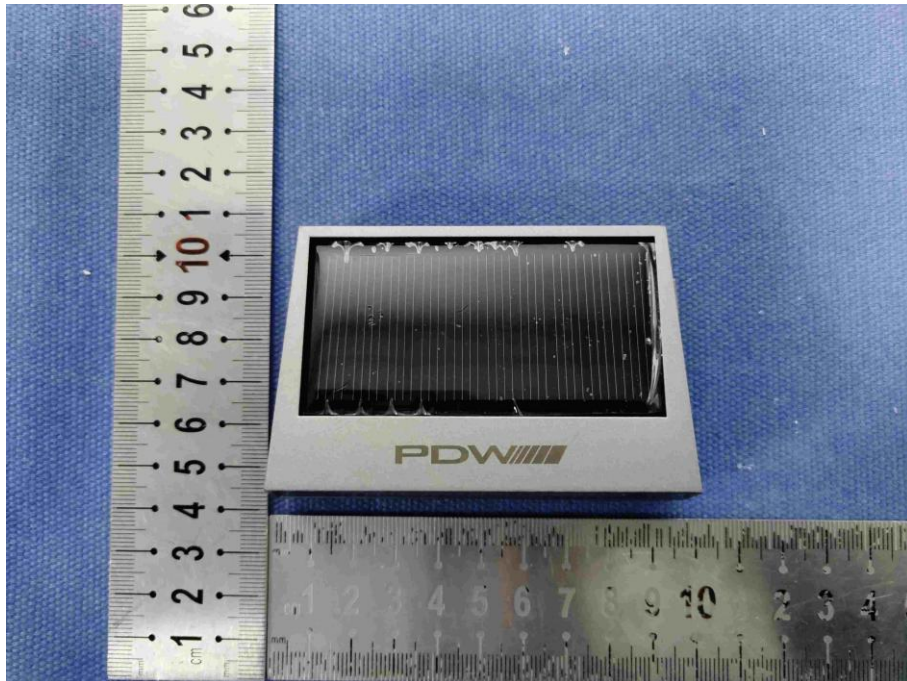


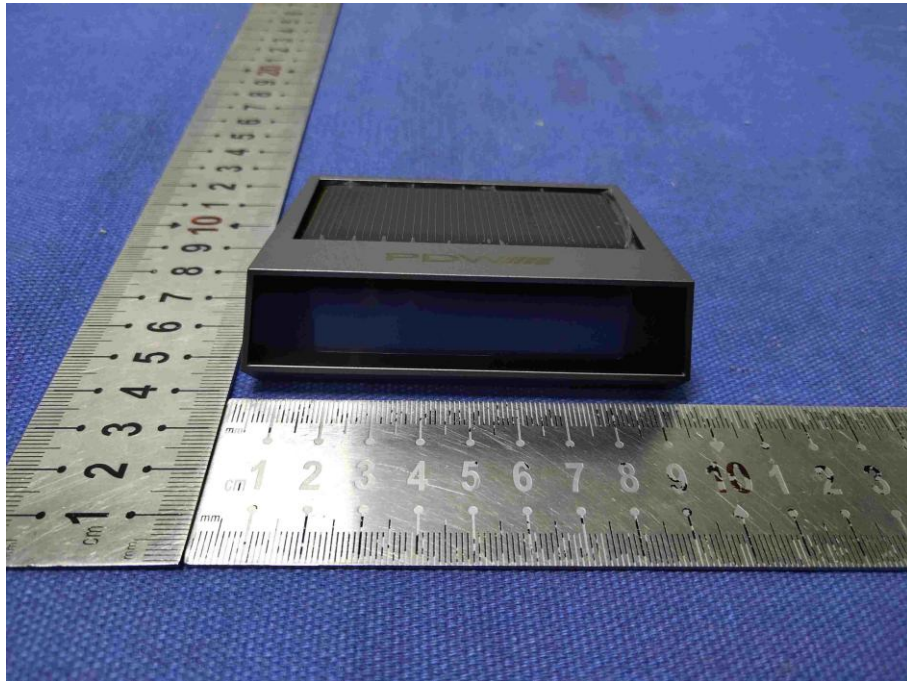
Conducted Emissions

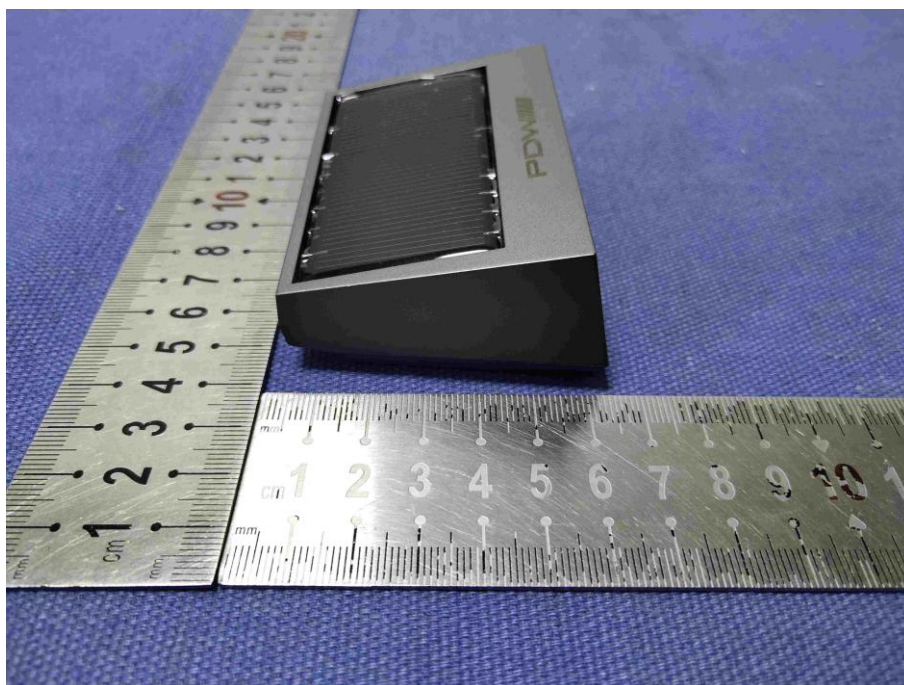
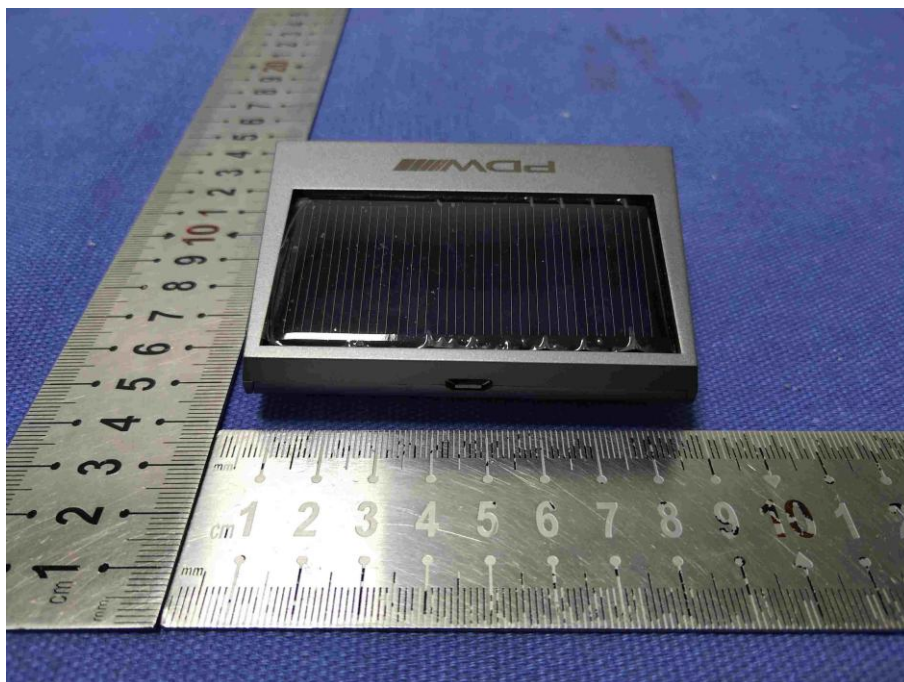


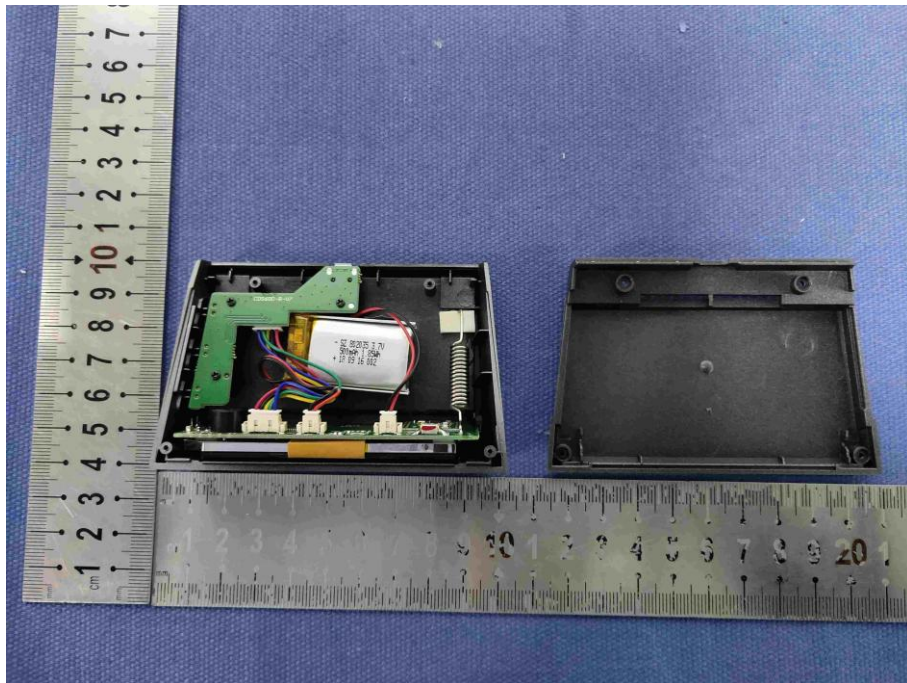
APPENDIX 2 PHOTOGRAPHS OF EUT

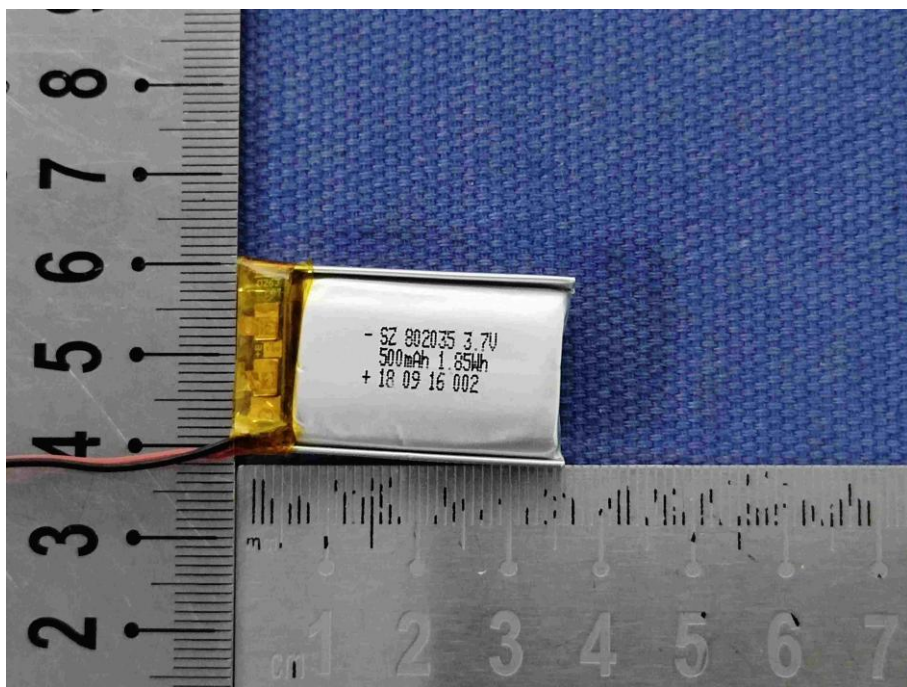
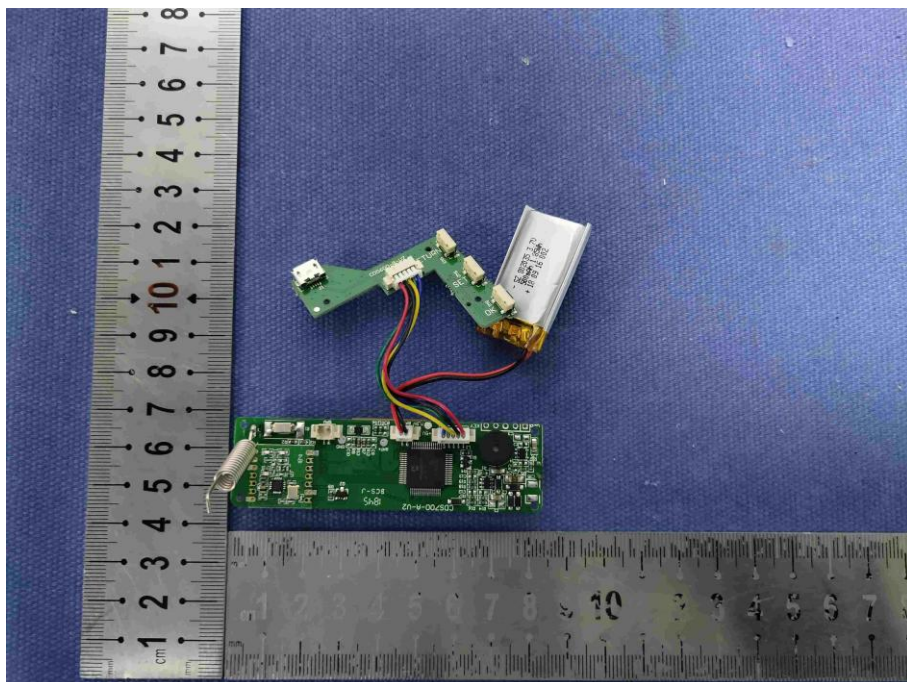
Test mode No.: 04.01.13

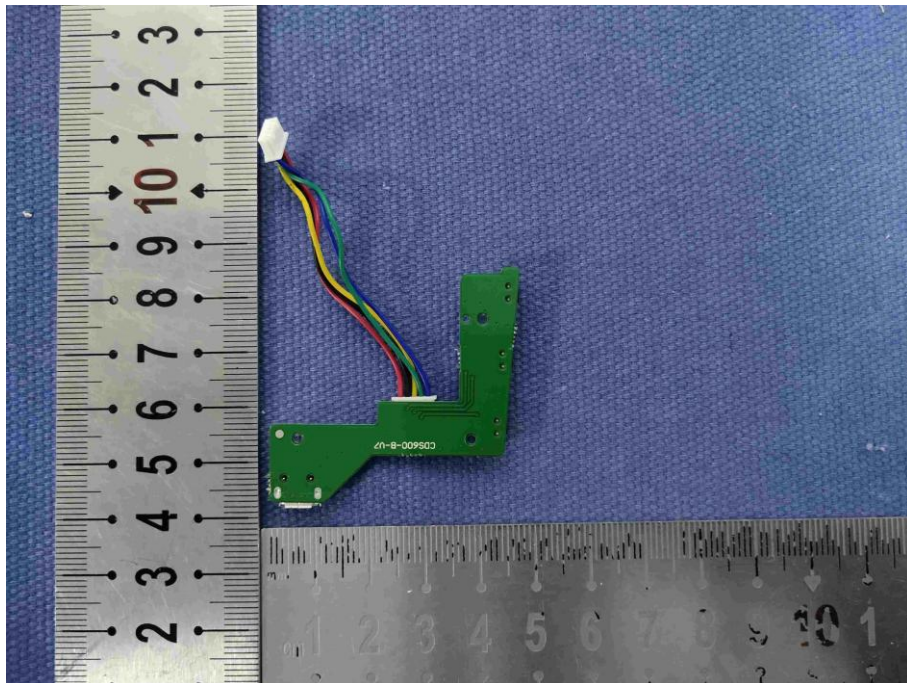
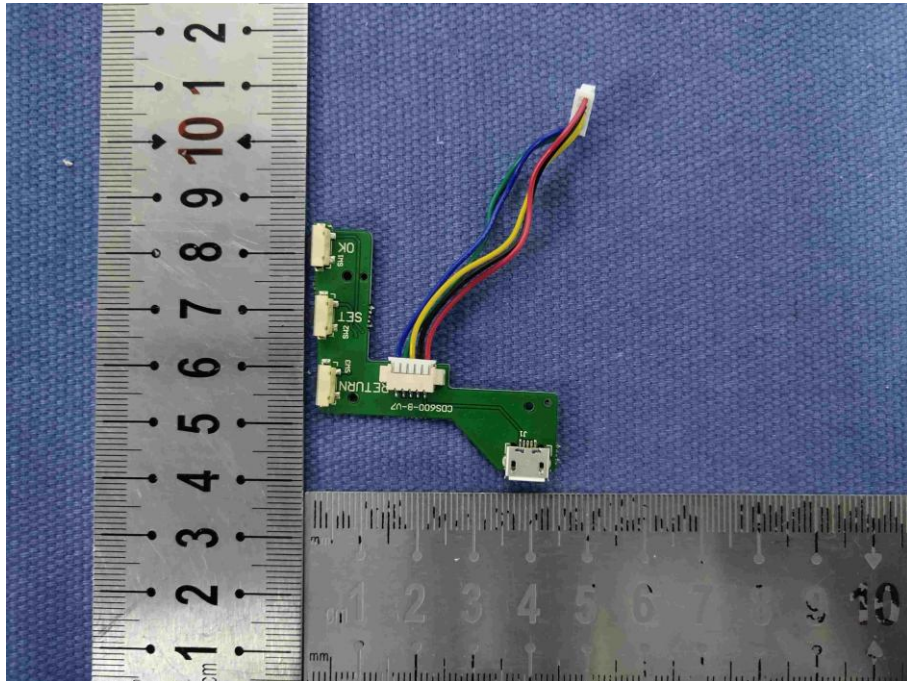


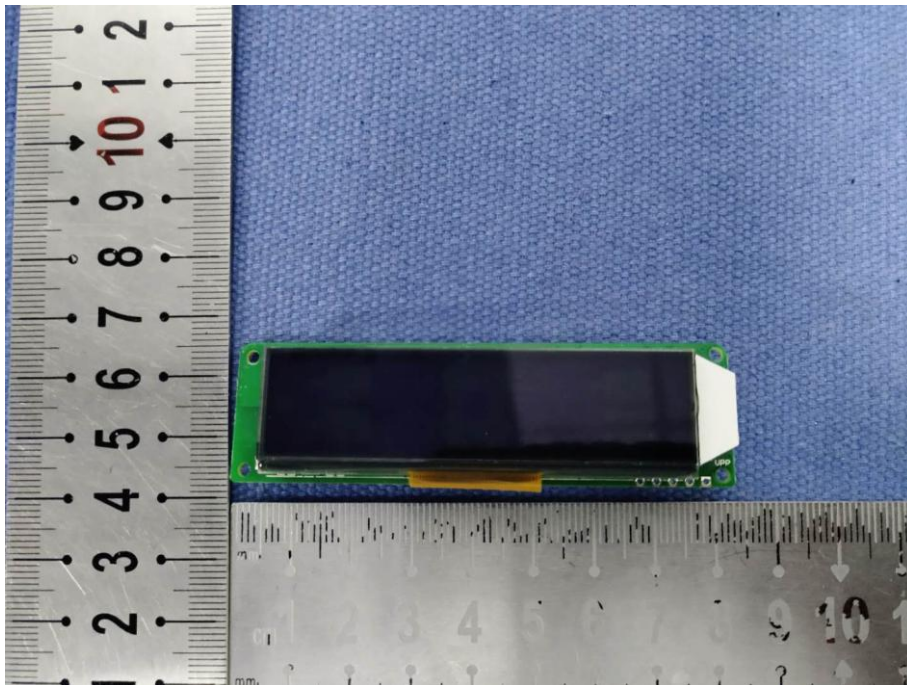
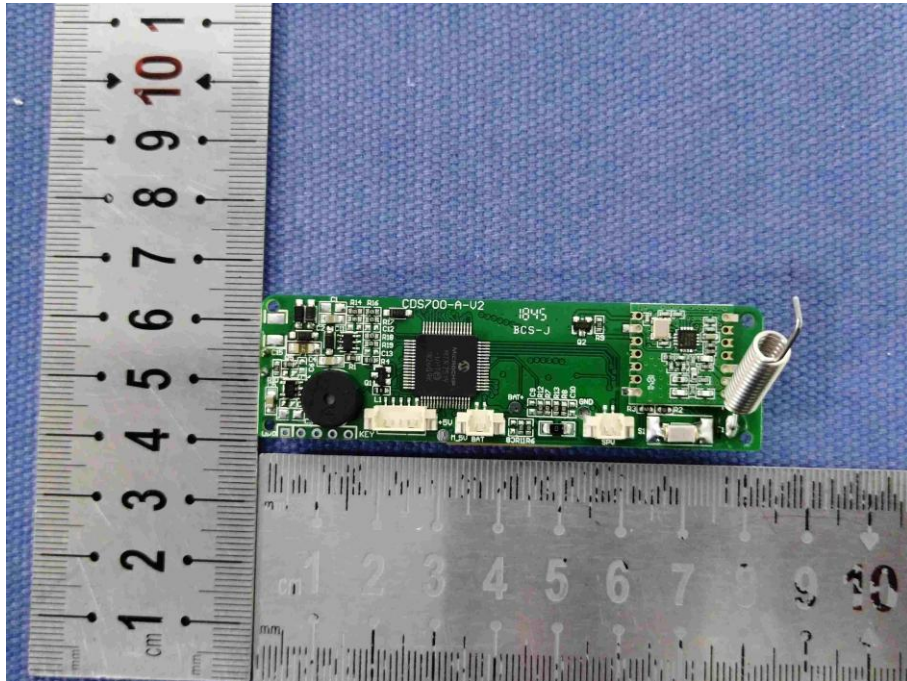


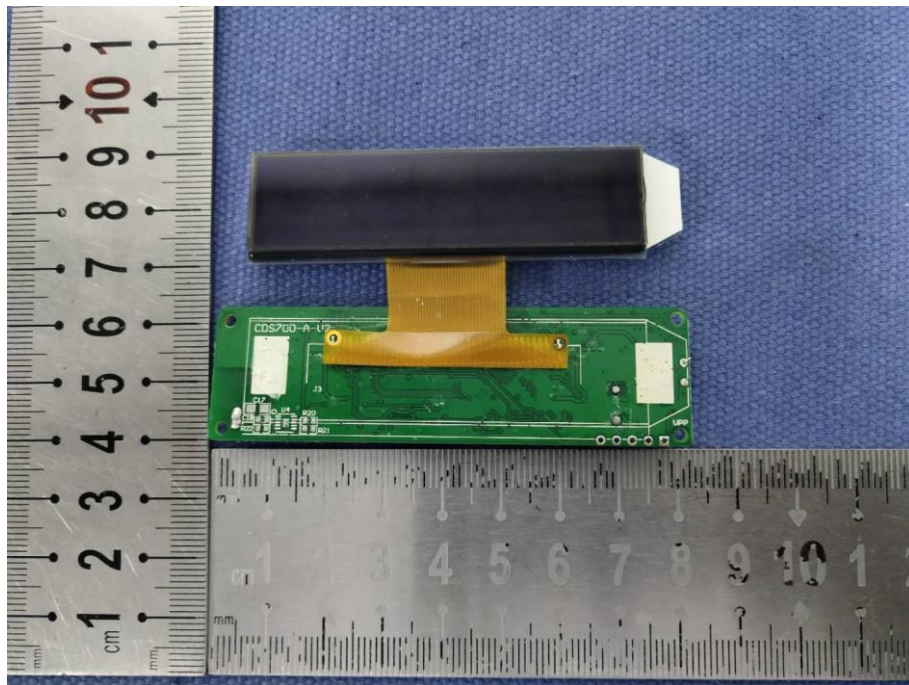
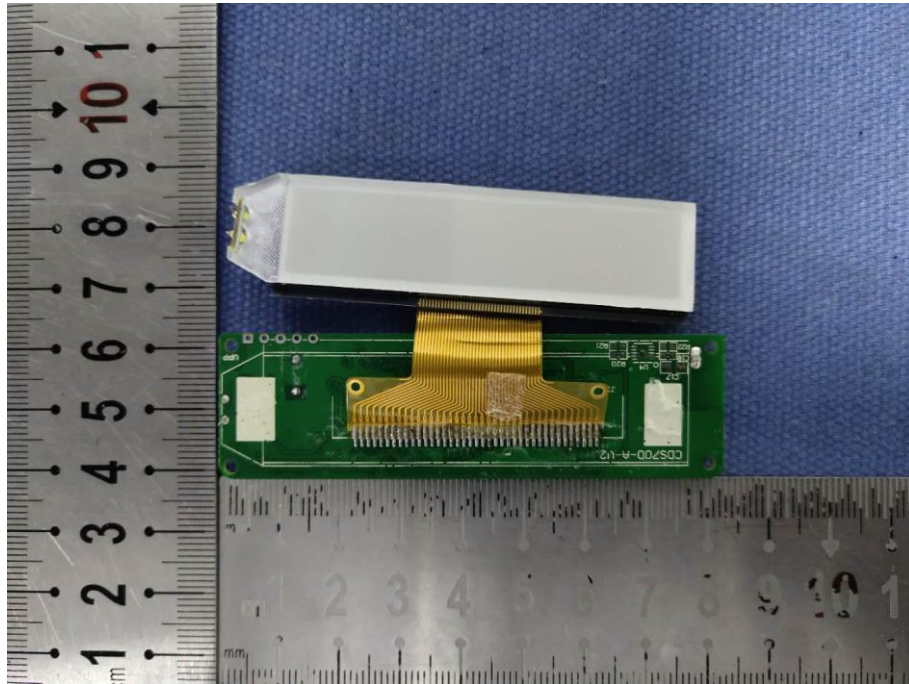


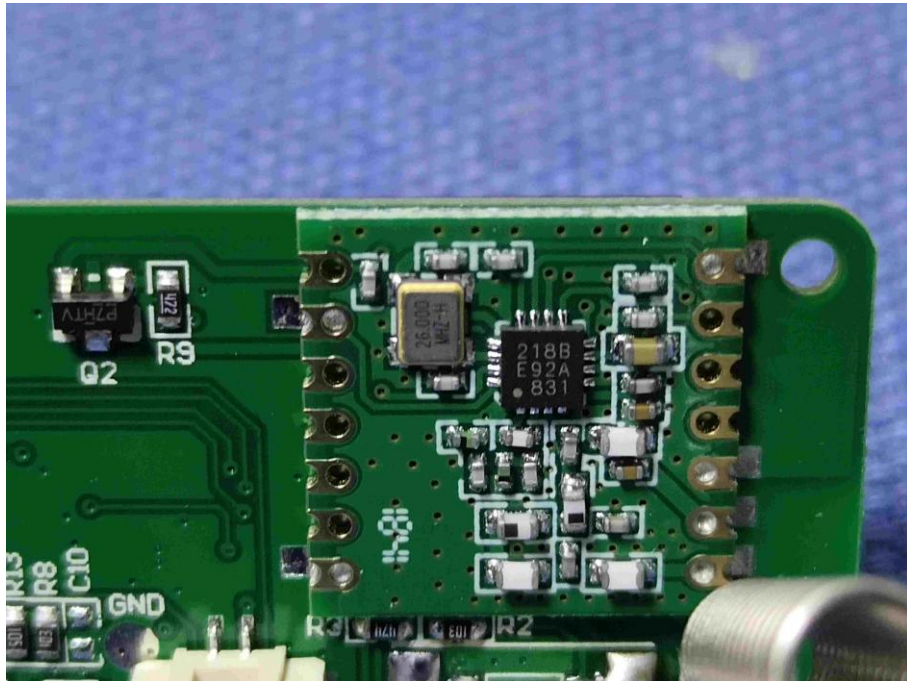












*** End of Report ***