

12 FIELD STRENGTH OF THE FUNDAMENTAL SIGNAL (15.249(A))

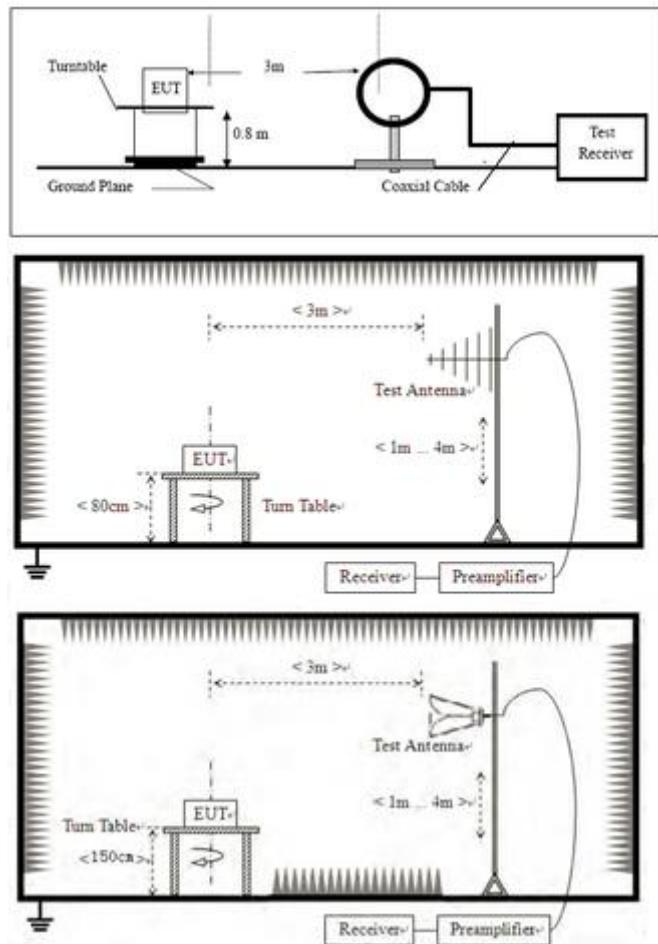
Test Standard	47 CFR Part 15, Subpart C 15.249
Test Method	ANSI C63.10 (2013) Section 6.5&6.6
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25°C
Humidity	60%

12.1 LIMITS

Fundamental frequency(MHz)	Field strength of fundamental(microvolts/meter)	Field strength of harmonics(microvolts/meter)
902-928	50	500
2400-2483.5	50	500
5725-5875	50	500
24000-24250	250	2500

Remark: The frequencies above 1000MHz are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

12.2 BLOCK DIAGRAM OF TEST SETUP



12.3 PROCEDURE

- For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter fully-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 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.

- h. Test the EUT in the lowest channel, the middle channel, the Highest channel.
- i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case.
- j. Repeat above procedures until all frequencies measured was complete.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

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12.4 TEST DATA

QP value:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Level (dB μ V/m)	Limit (dB μ V/m)	Over Limit (dB)	Antenna Polaxis
902.75	58.13	34.81	92.94	94.00	-1.06	H
902.75	49.39	34.81	84.20	94.00	-9.8	V

QP value:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Level (dB μ V/m)	Limit (dB μ V/m)	Over Limit (dB)	Antenna Polaxis
914.75	58.50	34.91	93.91	94.00	-0.09	H
914.75	45.78	34.91	80.69	94.00	-13.31	V

QP value:

Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Level (dB μ V/m)	Limit (dB μ V/m)	Over Limit (dB)	Antenna Polaxis
927.25	58.65	34.93	93.59	94.00	-0.41	H
927.25	49.26	34.94	84.20	94.00	-9.8	V

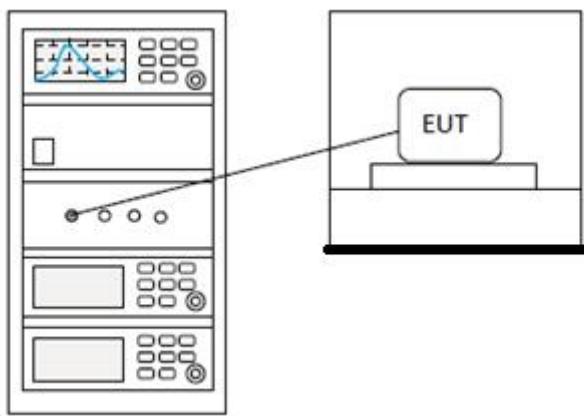
13 20DB BANDWIDTH

Test Standard	47 CFR Part 15, Subpart C 15.249
Test Method	ANSI C63.10 (2013) Section 6.9
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25 °C
Humidity	60%

13.1 LIMITS

Limit: N/A

13.2 BLOCK DIAGRAM OF TEST SETUP

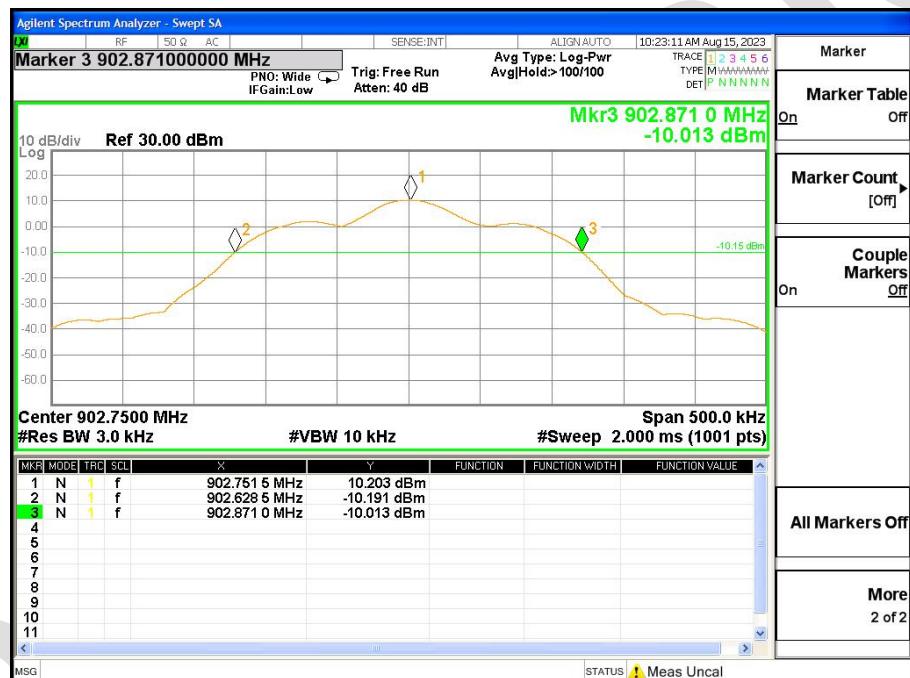


1.1 TEST DATA

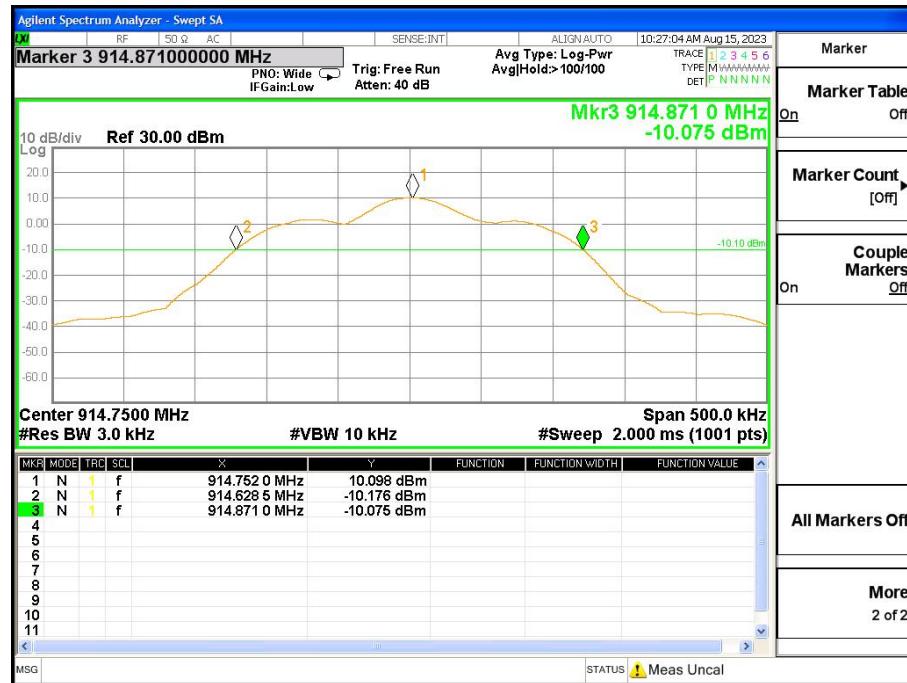
Test Frequency MHz	20dB Bandwidth MHz	Result
902.75	0.1195	Pass
914.75	0.1190	
927.25	0.1210	

1.2 TEST PLOTS

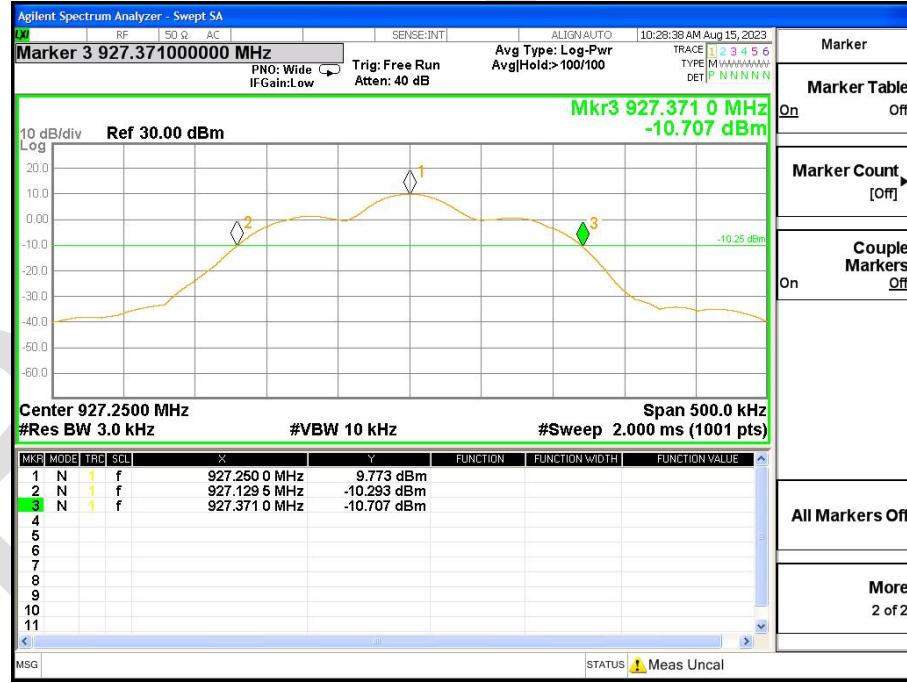
902.75:



914.75:



927.25:



14 CONDUCTED EMISSIONS AT AC POWER LINE (150KHZ-30MHZ)

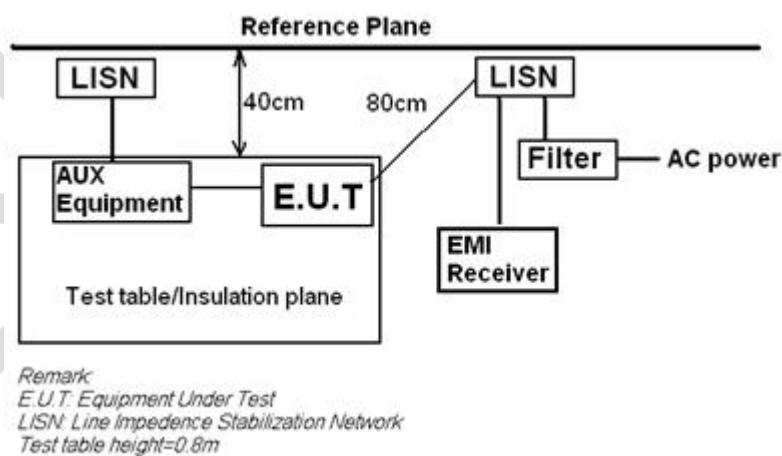
Test Standard	47 CFR Part 15, Subpart C 15.249
Test Method	ANSI C63.10 (2013) Section 6.2
Test Mode (Pre-Scan)	TX
Test Mode (Final Test)	TX
Tester	Jozu
Temperature	25°C
Humidity	60%

14.1 LIMITS

Frequency of emission(MHz)	Conducted 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.

14.2 BLOCK DIAGRAM OF TEST SETUP



14.3 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 50ohm/50H + 50hm linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

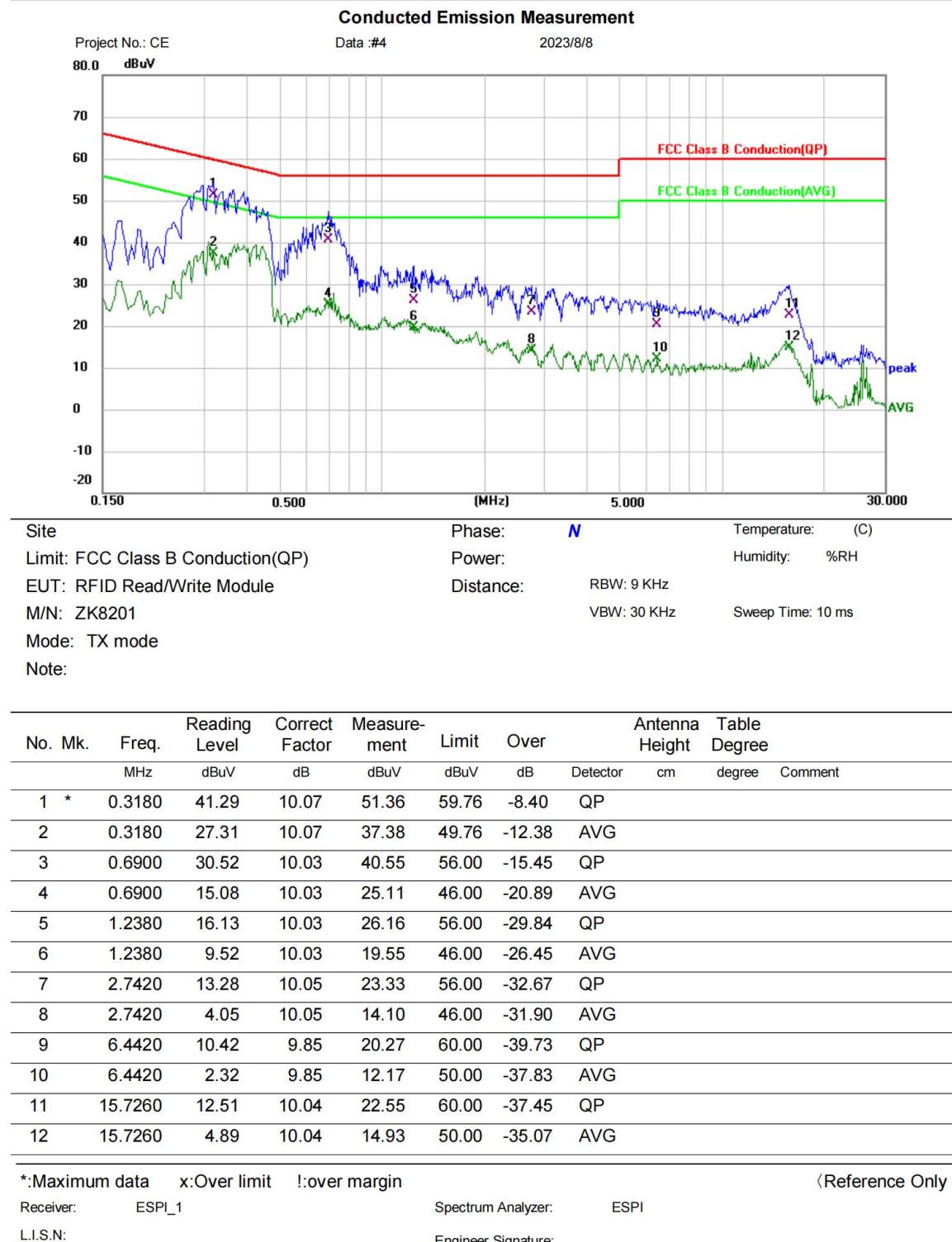
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Remark: LISN=Read Level+ Cable Loss+ LISN Factor

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14.4 TEST DATA

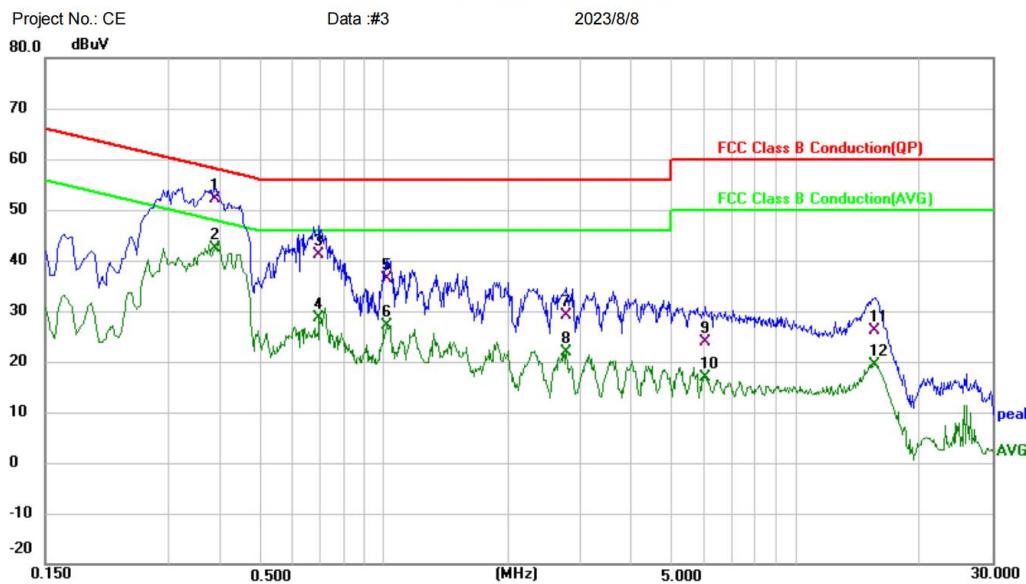
[TestMode: TX]; [Line: Nutral] ;[Power:AC120V/60Hz]



Test Result: Pass

[TestMethod: TX]; [Line: Line] ;[Power:AC120V/60Hz]

Conducted Emission Measurement


Site Phase: **L1** Temperature: (C)

Limit: FCC Class B Conduction(QP) Power: Humidity: %RH

EUT: RFID Read/Write Module Distance: RBW: 9 KHz

M/N: ZK8201 VBW: 30 KHz Sweep Time: 10 ms

Mode: TX mode

Note:

No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Antenna Height cm		Table Degree
							Detector	Comment	
1	0.3860	42.03	10.07	52.10	58.15	-6.05	QP		
2 *	0.3860	32.27	10.07	42.34	48.15	-5.81	AVG		
3	0.6940	30.96	10.09	41.05	56.00	-14.95	QP		
4	0.6940	18.54	10.09	28.63	46.00	-17.37	AVG		
5	1.0180	26.19	10.11	36.30	56.00	-19.70	QP		
6	1.0180	17.14	10.11	27.25	46.00	-18.75	AVG		
7	2.7780	18.97	10.24	29.21	56.00	-26.79	QP		
8	2.7780	11.60	10.24	21.84	46.00	-24.16	AVG		
9	6.0540	13.77	10.04	23.81	60.00	-36.19	QP		
10	6.0540	6.75	10.04	16.79	50.00	-33.21	AVG		
11	15.5180	16.23	9.95	26.18	60.00	-33.82	QP		
12	15.5180	9.35	9.95	19.30	50.00	-30.70	AVG		

*:Maximum data x:Over limit !:over margin

(Reference Only)

Receiver: ESPI_1

Spectrum Analyzer: ESPI

L.I.S.N:

Engineer Signature:

Test Result: Pass

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

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15 ANTENNA REQUIREMENT

Test Standard	47 CFR Part 15, Subpart C 15.249
Test Method	N/A

15.1 CONCLUSION

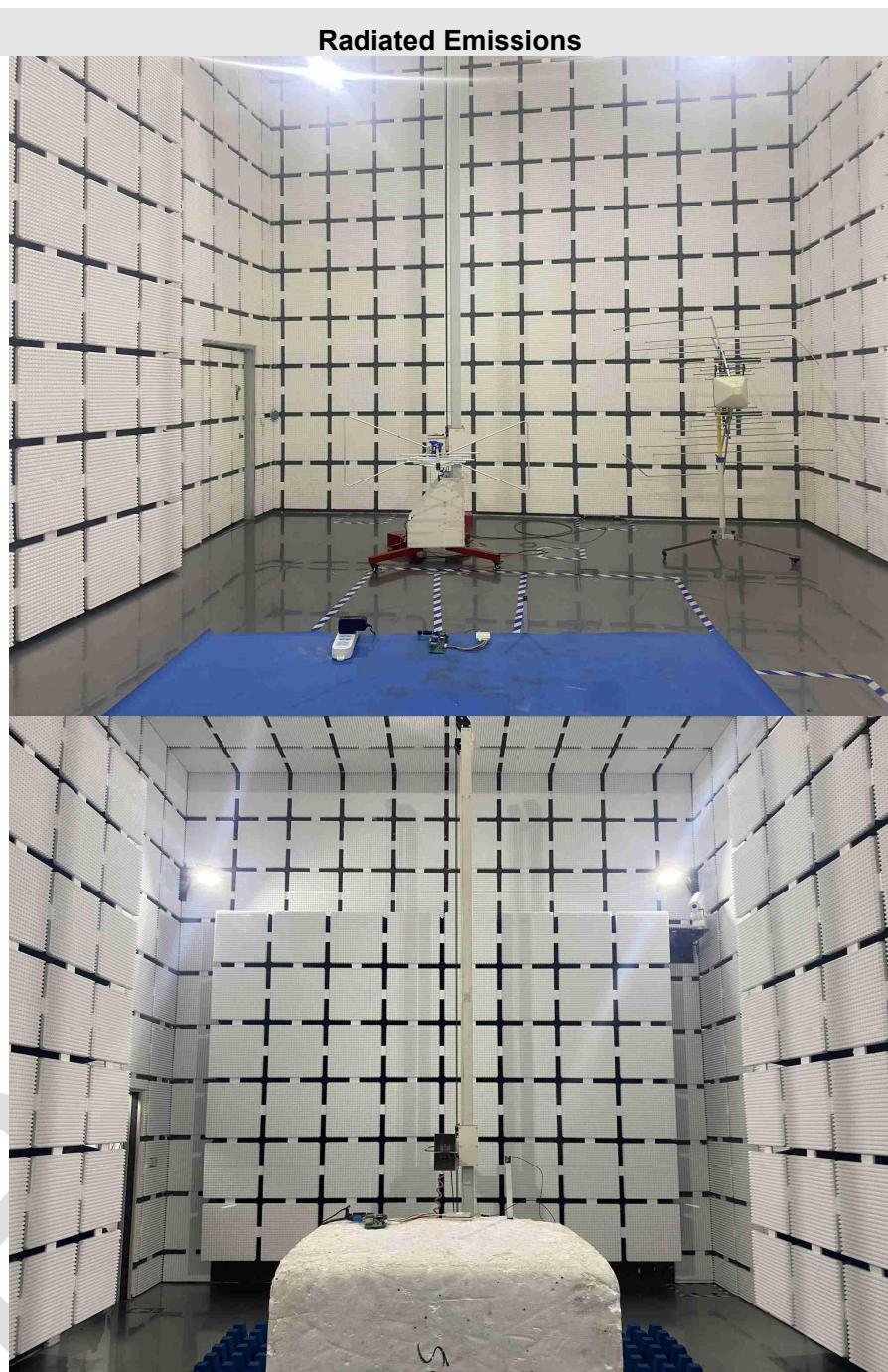
Standard Requirement:

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 antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit permanently attached antenna or of an so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

EUT Antenna:

The antenna is integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is -24.67dBi.

APPENDIX A: PHOTOGRAPHS OF TEST SETUP



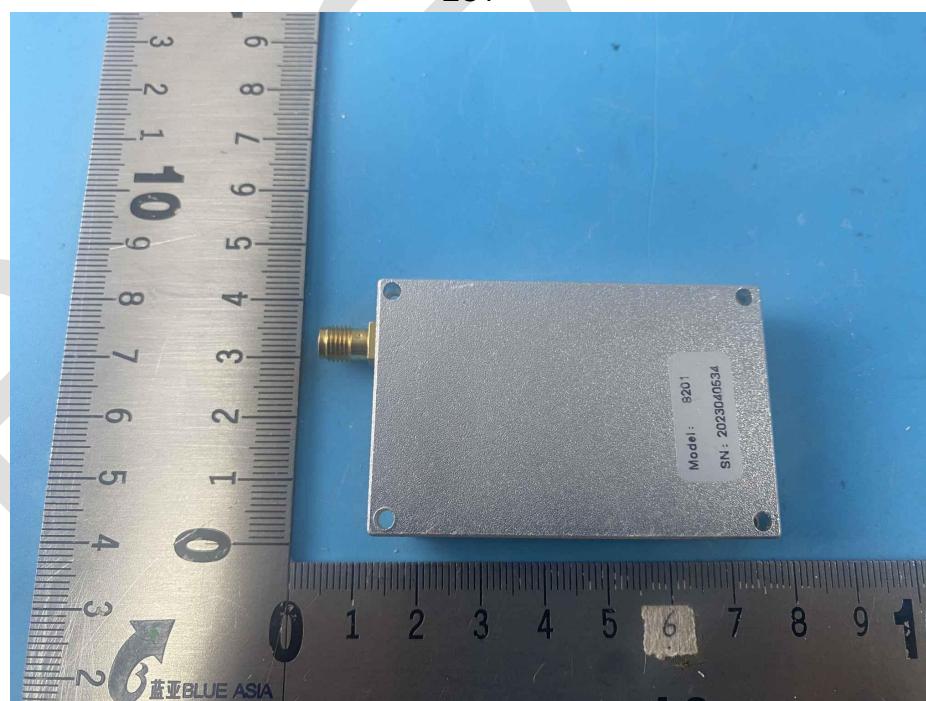
Conducted Emissions at AC Power Line (150kHz-30MHz)

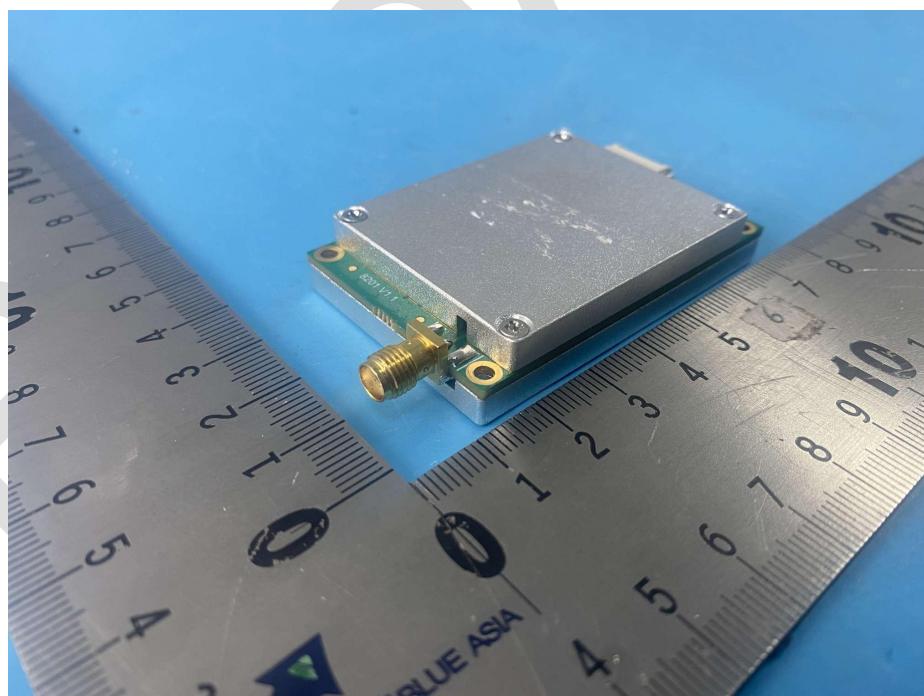
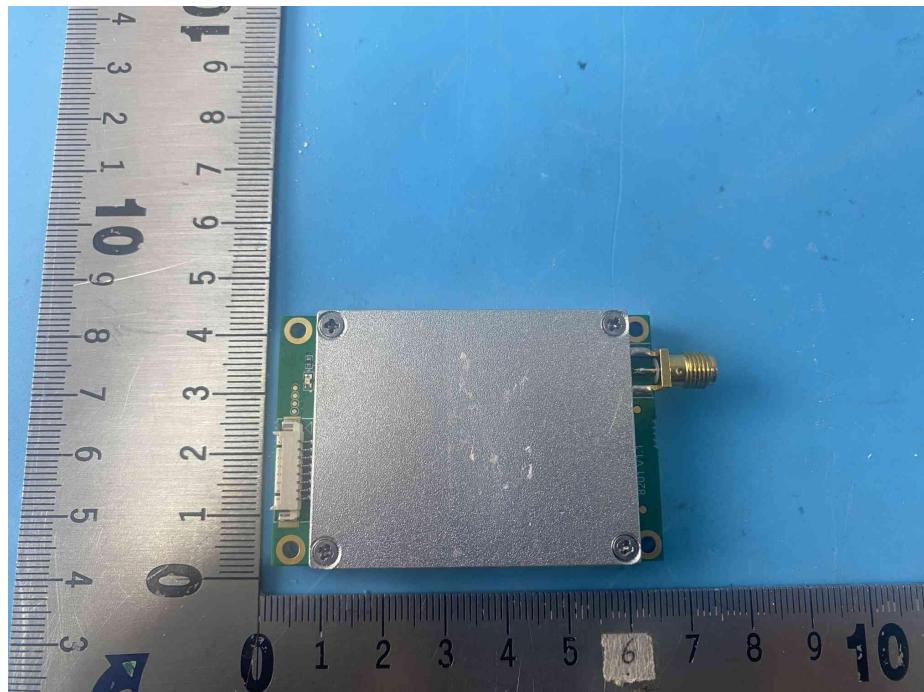


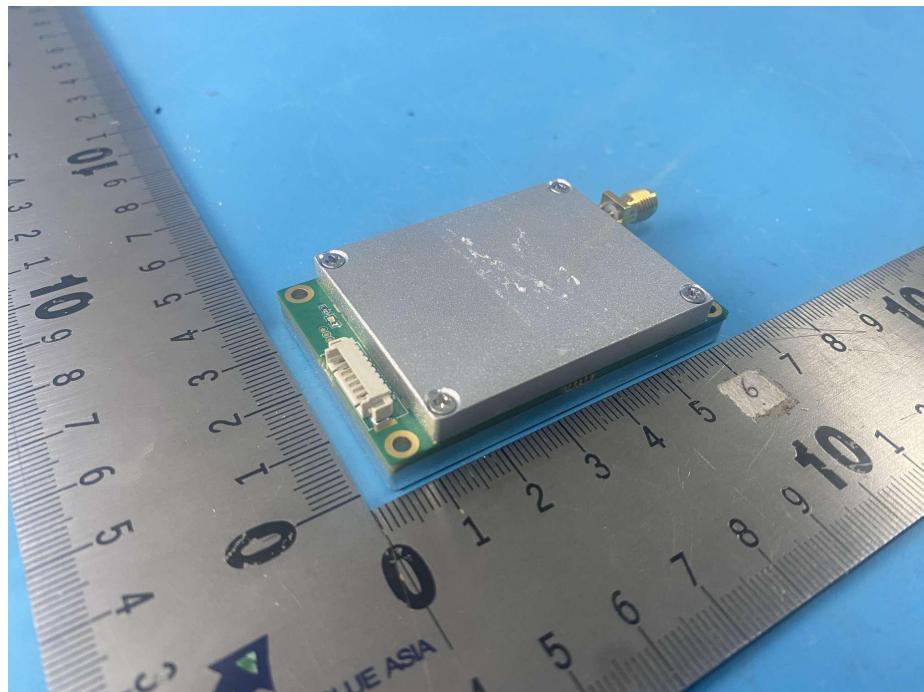
APPENDIX B: PHOTOGRAPHS OF EUT

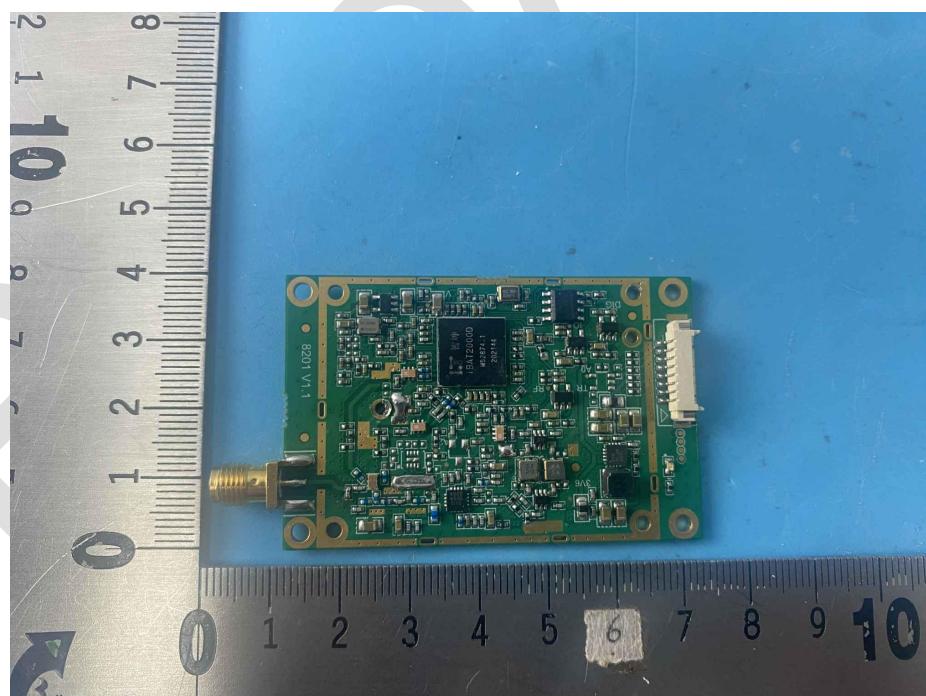
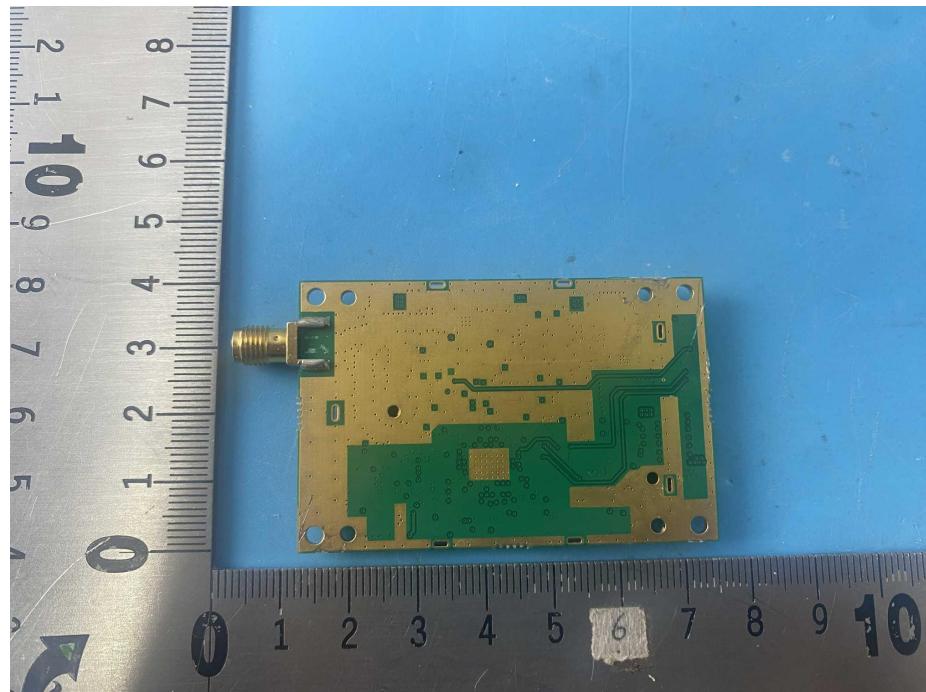


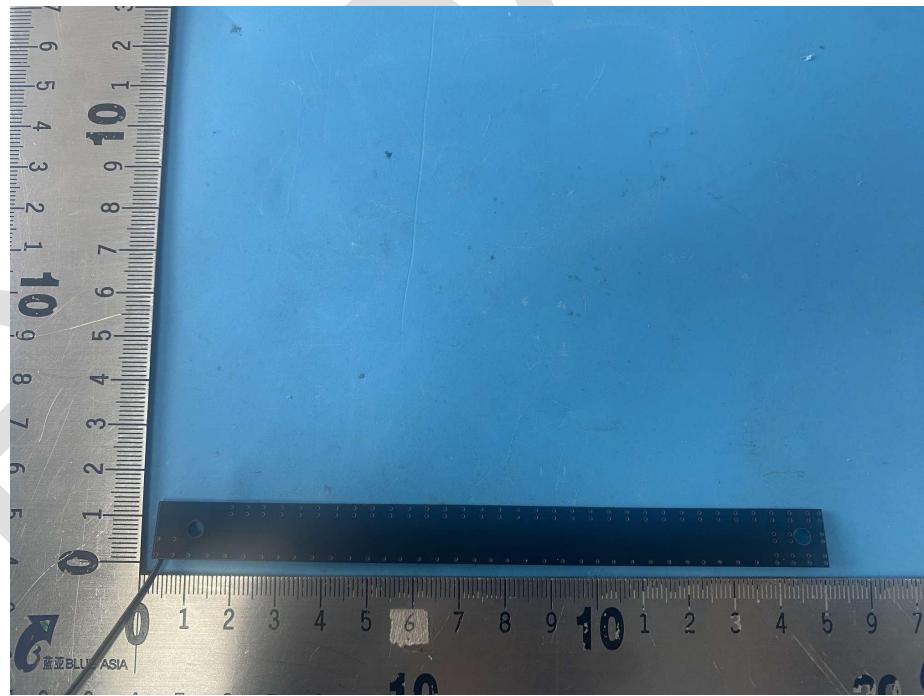
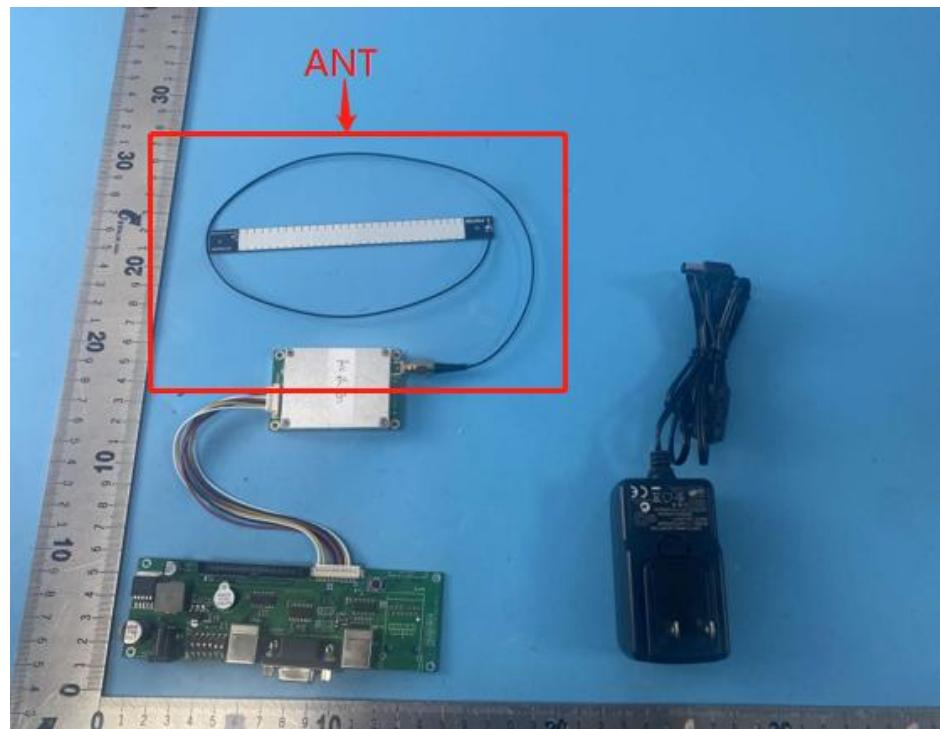
EUT

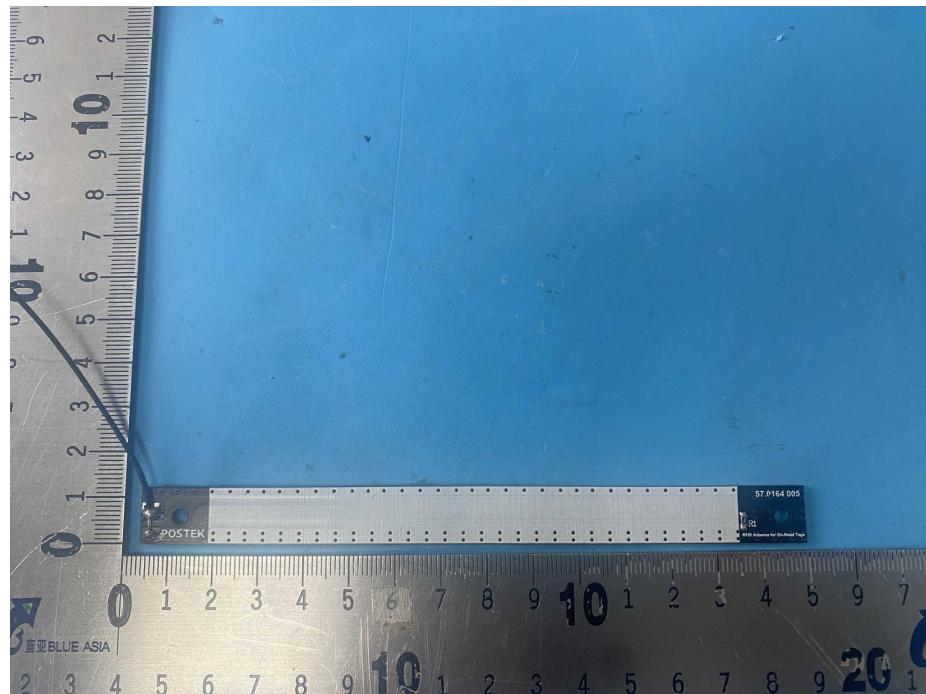




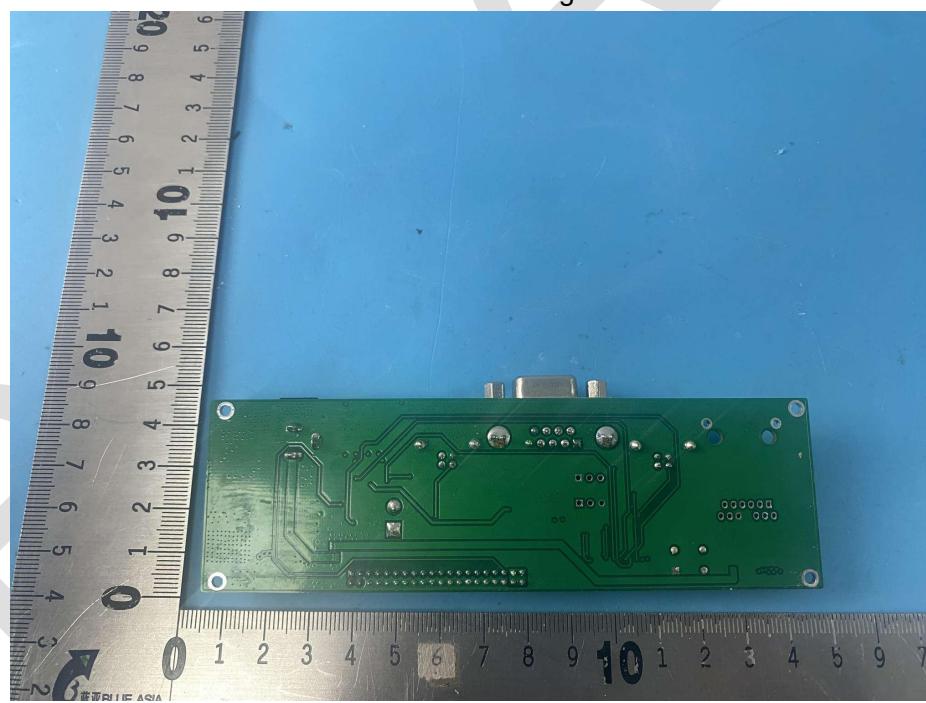


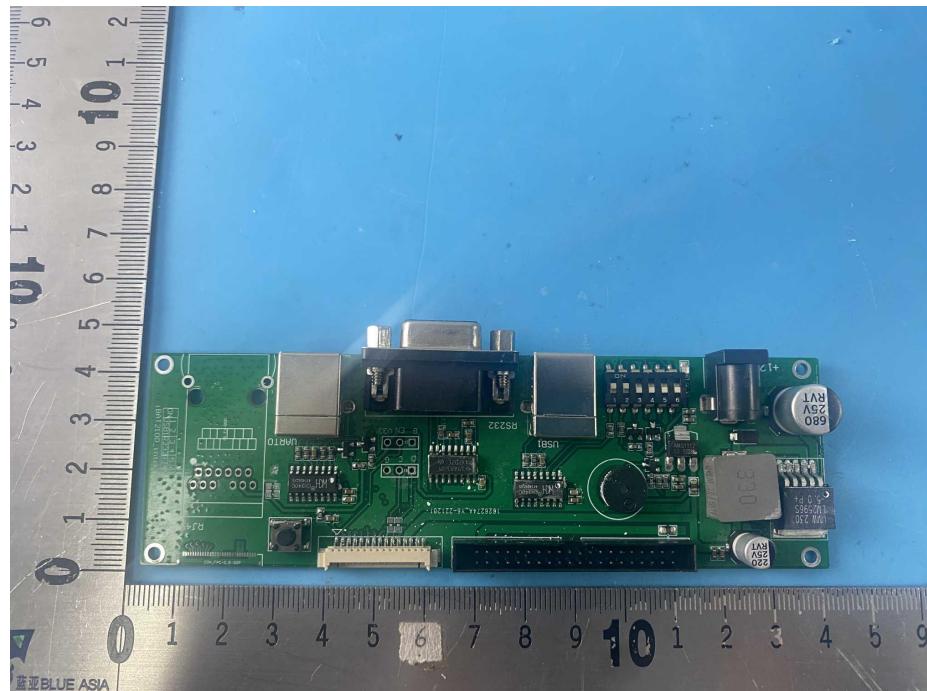






Board for Testing





----END OF REPORT----

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