TEST REPORT

Report No.:	BCTC2409825918-2E
Applicant:	Radxa Computer (Shenzhen) Co.,Ltd.
Product Name:	Radxa X4
Test Model:	Radxa X4 D8E64R30W16
Tested Date:	2024-09-30 to 2024-10-18
Issued Date:	2024-10-29

Shenzhen BCTC Testing Co., Ltd.

Product Name:	Radxa X4
Trademark:	radxa®
Model/Type reference:	Radxa X4 D8E64R30W16 Radxa X4 D4E32R30W16, Radxa X4 D4E0R30W16, Radxa X4 D8E64R30W16, Radxa X4 D8E0R30W16, Radxa X4 D12E128R30W16, Radxa X4 D12E0R30W16, Radxa X4 D16E256R30W16, Radxa X4 D16E0R30W16
Prepared For:	Radxa Computer (Shenzhen) Co.,Ltd.
Address:	1602, Smart Valley, tiezai Road, Gongle community, Xixiang, Baoan, Shenzhen
Manufacturer:	Radxa Computer (Shenzhen) Co.,Ltd.
Address:	1602, Smart Valley, tiezai Road, Gongle community, Xixiang, Baoan, Shenzhen
Prepared By:	Shenzhen BCTC Testing Co., Ltd.
Address:	1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China
Sample Received Date:	2024-09-30
Sample tested Date:	2024-09-30 to 2024-10-18
Issue Date:	2024-10-29
Report No.:	BCTC2409825918-2E
Test Standards:	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-3 V2.3.2 (2023-01) ETSI EN 301 489-17 V3.2.4 (2020-09)
Test Results:	PASS
Remark:	This is RED EMC test report.

Tested by:

Shanshan Zhang/ Project Handler

Approved by:

Zero Zhou/Reviewer

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Testing Co., Ltd, this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

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(Note: N/A means not applicable)

1. Version

Report No.	Issue Date	Description	Approved
BCTC2409825918-2E	2024-10-29	Original	Valid

2. Test Summary

The Product has been tested according to the following specifications:

EMISSION		
Standard	**Test Item**	**Test result**
EN 301 489-1	Conducted emissions from the AC mains power ports	Pass
EN 301 489-1	Asymmetric mode conducted emissions	Pass
EN 301 489-1	Conducted differential voltage emissions	N/A[1]
EN 301 489-1	Radiated emissions	Pass
EN 301 489-1	Harmonic current emission(H)	N/A[4]
EN 301 489-1	Voltage fluctuations & flicker(F)	N/A[4]

IMMUNITY		
Standard	**Test Item**	**Test result**
EN 301 489-1	Electrostatic discharge (ESD)	Pass
EN 301 489-1	Continuous RF electromagnetic field disturbances(RS)	Pass
EN 301 489-1	Electrical fast transients/burst (EFT)	N/A[4]
EN 301 489-1	Surges	N/A[4]
EN 301 489-1	Radio frequency, common mode	N/A[4]
EN 301 489-1	Voltage dips and interruptions (DIPS)	N/A[4]

Remark:
1. Applicable to ports listed above and intended to connect to cables longer than 3 m.
2. The Product has no antenna port.
3. The Product belongs to Class A, and its power is less than 75W, so it deems to fulfil this standard without testing.
4. The EUT is powered by the DC only, the test item is not applicable.

3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Value (dB)
Conducted Emission (150kHz-30MHz)	3.10
Conducted Emission at telecommunication port using AAN (150kHz-30MHz)	3.90(cat 3) 4.30(cat 5) 4.80(cat 6)
Radiated Emission(30MHz~200MHz)	4.60
Radiated Emission(200MHz~1GHz)	5.20
Radiated Emission(1GHz~6GHz)	5.20

4. Product Information And Test Setup

4.1 Product Information

Model/Type reference:	Radxa X4 D8E64R30W16 Radxa X4 D4E32R30W16, Radxa X4 D4E0R30W16, Radxa X4 D8E64R30W16, Radxa X4 D8E0R30W16, Radxa X4 D12E128R30W16, Radxa X4 D12E0R30W16, Radxa X4 D16E256R30W16, Radxa X4 D16E0R30W16
Model differences:	All the model are the same circuit and RF module, except model names and internal storage.
Bluetooth version:	5.0
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	Bluetooth(BDR+EDR)+ Bluetooth(BLE): 2402-2480MHz WIFI(2.4GHz): IEEE 802.11b/g/n HT20/ ax HT20: 2412MHz-2472MHz IEEE 802.11n HT40/ ax HT40: 2422MHz-2462MHz WIFI(5.1GHz): IEEE 802.11a/n/ac HT20/ax HT20: 5180MHz-5240MHz IEEE 802.11n/ac HT40/ax HT40: 5190 MHz-5230MHz IEEE 802.11ac HT80/ax HT80: 5210MHz WIFI(5.8GHz): IEEE 802.11a/n/ac HT20/ax HT20: 5745MHz-5825MHz IEEE 802.11n/ac HT40/ax HT40: 5755 MHz-5795MHz IEEE 802.11ac HT80/ax HT80: 5775MHz
Max. RF output power:	Bluetooth(BDR+EDR): 7.98 dBm Bluetooth(BLE): 5.86 dBm WIFI(2.4GHz) : Antenna A: 11.23 dBm, Antenna B: 11.26 dBm, MIMO: 12.83 dBm WIFI(5.1GHz): Antenna A: 10.51 dBm, Antenna B: 10.27 dBm, MIMO: 12.47 dBm WIFI(5.8GHz): Antenna A: 10.91 dBm, Antenna B: 10.33 dBm, MIMO: 12.46 dBm
Type of Modulation:	Bluetooth(BDR+EDR): GFSK, π/4DQPSK, 8DPSK Bluetooth(BLE):GFSK WIFI(2.4GHz +5GHz+5.8GHz): DSSS, OFDM, OFDMA
Antenna installation:	Bluetooth(EDR+BLE)+ WIFI(2.4GHz+5.1GHz+5.8GHz): FPC antenna
Antenna Gain:	Bluetooth(BDR+EDR)+ Bluetooth(BLE): 1.65 dBi WIFI(2.4GHz): Antenna A: 1.65 dBi, Antenna B: 1.65 dBi WIFI(5.1GHz): Antenna A: 1.4 dBi, Antenna B: 1.4 dBi WIFI(5.8GHz): Antenna A: 1.44 dBi, Antenna B: 1.44 dBi Remark: ☒ The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information. ☐ The antenna gain of the product is provided by the customer, and the test data is affected by the customer information.
Ratings:	DC 12V from adapter

Cable of Product

No.	Cable Type	Quantity	Provider	Length (m)	Shielded	Note
1	--	--	Applicant	---	No	With a ferrite ring in mid Detachable
2	--	--	BCTC	--	No	--

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
1.	ADAPTER	Hoco.	N18	---	---
2.	Display	AOC	T2264MD	---	---
3.	Display	AOC	24G2	---	---
4.	Earphone	IHIP	SBGE1	---	---
5.	Disk	INTEL	256G	---	---
6.	Disk	Samsung	250G	---	---
7.	keyboard	Logitech	1641MG01DLZ8	---	---
8.	Mouse	Logitech	M-U0026	---	---

Notes

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Test Mode

Test item	Test Mode	Test Voltage
Conducted emissions from the AC mains power ports (150KHz-30MHz) Class B	Mode 1	AC 230V/50Hz
	Mode 2*	AC 230V/50Hz
	Mode 3	AC 230V/50Hz
Asymmetric mode conducted emissions(150KHz-30MHz) Class B	RJ45 (2500Mbps)	AC 230V/50Hz
Radiated emissions(30MHz-1GHz) Class B	Mode 1*	AC 230V/50Hz
	Mode 2	AC 230V/50Hz
	Mode 3	AC 230V/50Hz
Electrostatic discharge (ESD) B ☒Air Discharge: ±2kV,±4kV,±8kV ☒Contact Discharge: ±2kV,±4kV ☒HCP & VCP: ±2kV,±4kV	Mode 1	AC 230V/50Hz
	Mode 2	AC 230V/50Hz
	Mode 3	AC 230V/50Hz
Continuous RF electromagnetic field disturbances(RS) 80MHz-6000MHz 3V/m,80% AM Front, Rear, Left, Right H/V	Mode 1	AC 230V/50Hz
	Mode 2	AC 230V/50Hz
	Mode 3	AC 230V/50Hz
All test mode were tested and passed, only Conducted Emissions, Radiated Emissions and Voltage Fluctuations and Flicker shows (*) is the worst case mode which were recorded in this report.		

Remark:
Mode 1: BT +2.4G wifi +HDMI IN*2+USB-A 3.0*3+USB-A 2.0*1+ earphone
Mode 2: BT +5G wifi +HDMI IN*2+ USB-A 3.0*3+USB-A 2.0*1+ earphone
Mode 3: BT +LAN+HDMI IN*2+ USB-A 3.0*3+USB-A 2.0*1+earphone

5. Test Facility and test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

Conducted Emissions Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Receiver	R&S	ESR3	102075	May 16, 2024	May 15, 2025
LISN	R&S	ENV216	101375	May 16, 2024	May 15, 2025
ISN	HPX	ISN T800	S1509001	May 16, 2024	May 15, 2025
Software	Frad	EZ-EMC	EMC-CON 3A1	\	\
Pulse limiter	Schwarzbeck	VTSD 9561-F	01323	May 16, 2024	May 15, 2025

Radiated Emissions Test (966 Chamber#01)					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
966 chamber	ChengYu	966 Room	966	May 15, 2023	May 14, 2026
Receiver	R&S	ESRP	101154	May 16, 2024	May 15, 2025
Receiver	R&S	ESR3	102075	May 16, 2024	May 15, 2025
Amplifier	SKET	LAPA_01G18G-45dB	SK2021040901	May 16, 2024	May 15, 2025
Amplifier	Schwarzbeck	BBV9744	9744-0037	May 16, 2024	May 15, 2025
TRILOG Broadband Antenna	schwarzbeck	VULB9163	942	May 21, 2024	May 20, 2025
Horn Antenna	schwarzbeck	BBHA9120D	1541	May 21, 2024	May 20, 2025
Software	Frad	EZ-EMC	FA-03A2 RE	\	\

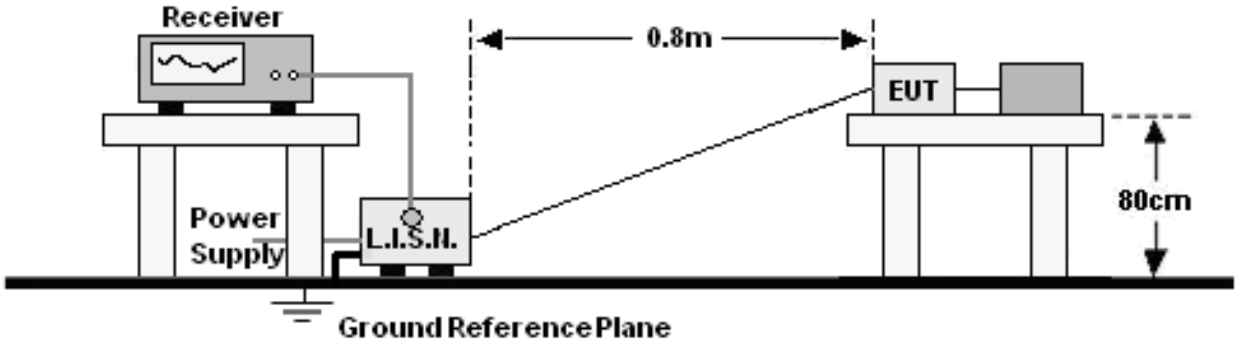
Electrostatic Discharge Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Electrostatic Discharge Simulator	3C TEST	EDS 30T	ES031000123059	Mar. 13, 2024	Mar. 12, 2025

Continuous RF Electromagnetic Field Disturbances Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Power meter	Keysight	E4419	A00065	May 16, 2024	May 15, 2025
Power sensor	Keysight	E9300A	US39211659	May 16, 2024	May 15, 2025
Power sensor	Keysight	E9300A	US39211305	May 16, 2024	May 15, 2025
Amplifier	SKET	HAP_801000-250W	21201805013	May 16, 2024	May 15, 2025
Amplifier	SKET	HAP_0103-75W	21201805014	May 16, 2024	May 15, 2025
Amplifier	SKET	HAP_0306-50W	21201805015	May 16, 2024	May 15, 2025
Stacked double Log.-Per. Antenna	Schwarzbeck	STLP 9129	00077	\	\
Field Probe	Narda	EP-601	611WX80256	May 25, 2024	May 24, 2025
Signal Generator	Agilent	N5181A	MY50143748	May 16, 2024	May 15, 2025
Software	SKET	EMC-S	1.2.0.18	\	\

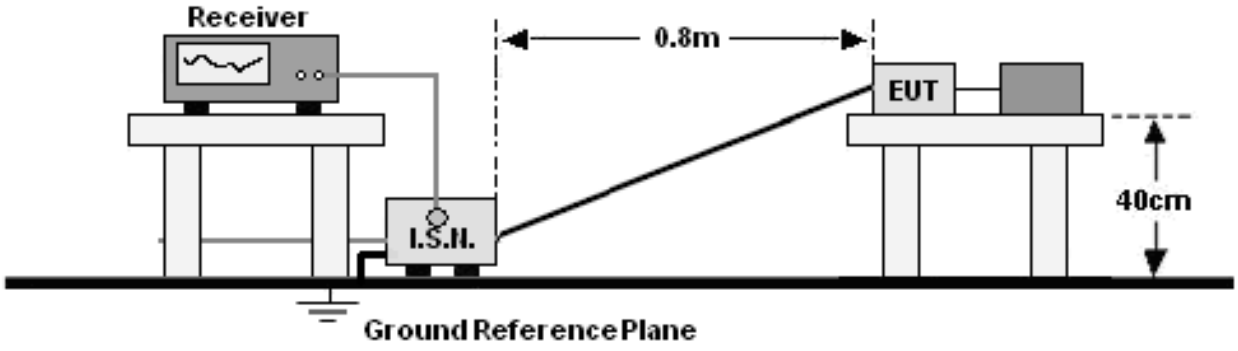
6. Conducted emissions

6.1 Block Diagram Of Test Setup

For mains ports:



For asymmetric mode ports:



6.2 Limit

Limits for Conducted emissions at the mains ports of Class B MME

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0,15 to 0,50	66 to 56*	56 to 46*
0,50 to 5	56	46
5 to 30	60	50

Notes: 1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

Limits for asymmetric mode conducted emissions of Class B MME

Frequency range	Voltage Limits dB(μV)		Current Limits dB(μA)	
	Quasi-peak	Average	Quasi-peak	Average
0,15 to 0,50	84-74	74-64	40-30	30-20
0,50 to 30	74	64	30	20

Notes: *Decreasing linearly with logarithm of frequency.

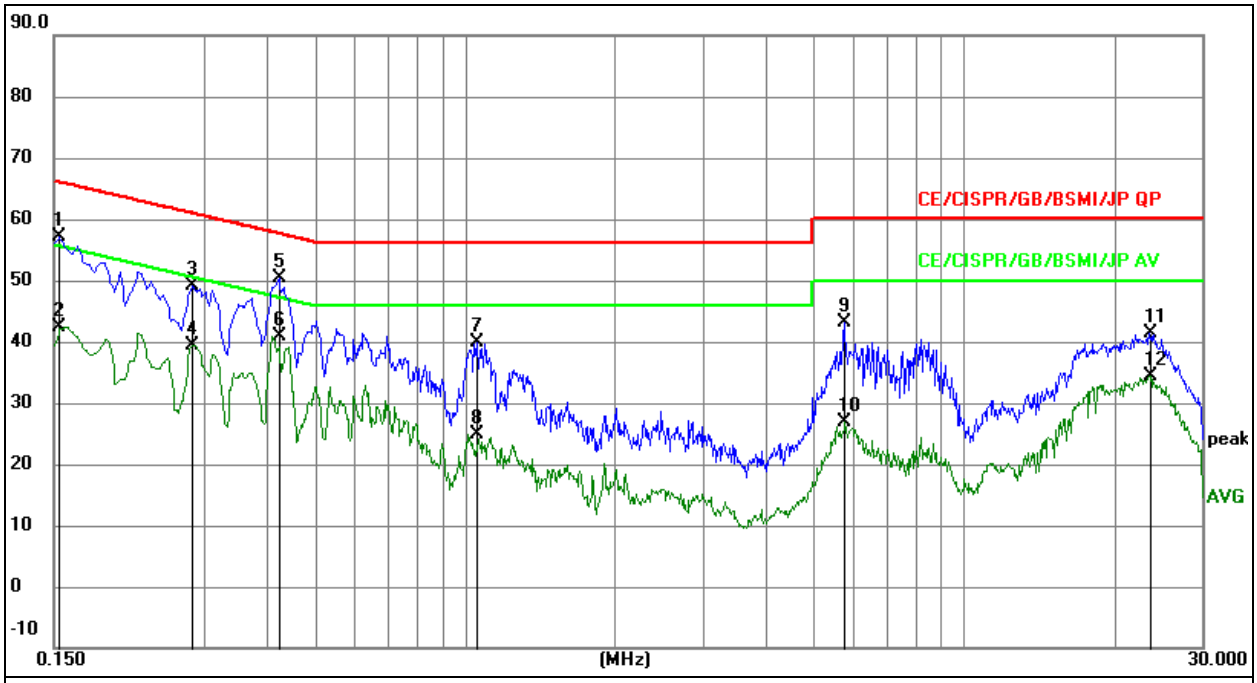
6.3 Test procedure

For mains ports:
a. The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

For asymmetric mode ports:
a. The Product was placed on a non-conductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the associated port through current probe.
b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

6.4 Test Result

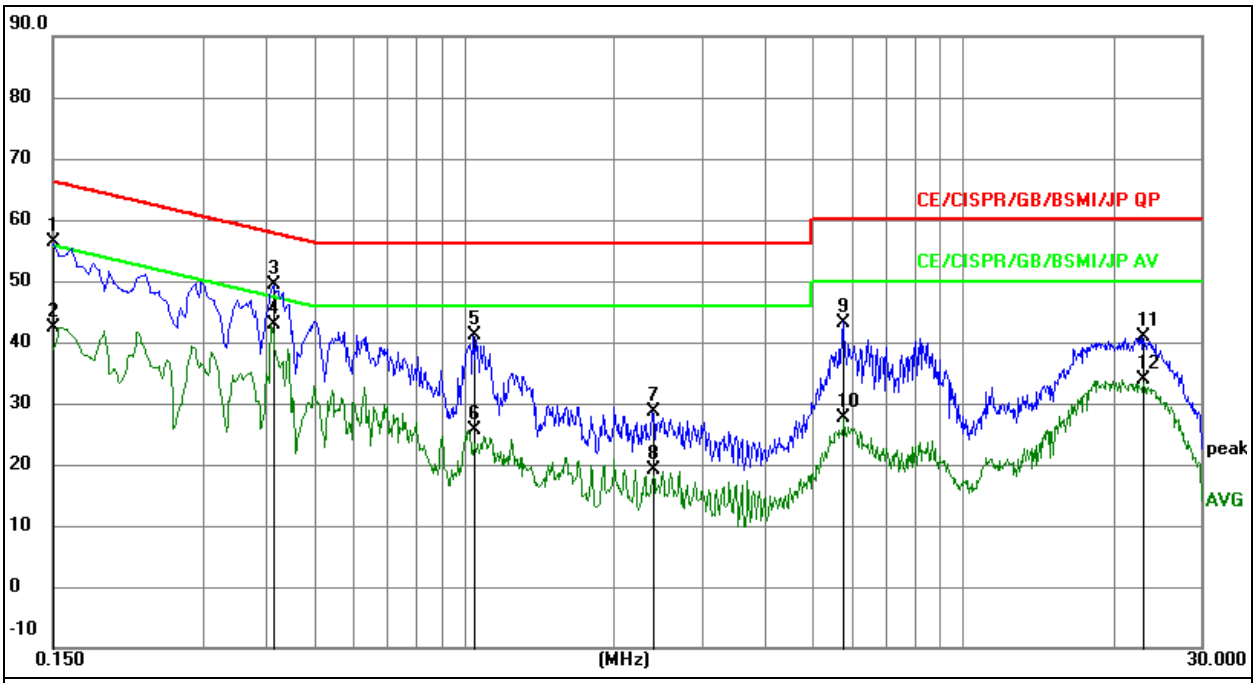
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	L
Test Mode:	The worst data(Mode 2)	Remark:	N/A



Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement=Reading Level+Correct Factor
4. Over=Measurement-Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.1539	37.00	20.07	57.07	65.79	-8.72	QP
2		0.1539	22.39	20.07	42.46	55.79	-13.33	AVG
3		0.2847	29.05	20.07	49.12	60.68	-11.56	QP
4		0.2847	19.43	20.07	39.50	50.68	-11.18	AVG
5		0.4237	30.23	20.08	50.31	57.38	-7.07	QP
6	*	0.4237	20.73	20.08	40.81	47.38	-6.57	AVG
7		1.0541	19.72	20.09	39.81	56.00	-16.19	QP
8		1.0541	4.67	20.09	24.76	46.00	-21.24	AVG
9		5.7437	22.97	20.15	43.12	60.00	-16.88	QP
10		5.7437	6.78	20.15	26.93	50.00	-23.07	AVG
11		23.5112	21.13	20.31	41.44	60.00	-18.56	QP
12		23.5112	14.06	20.31	34.37	50.00	-15.63	AVG

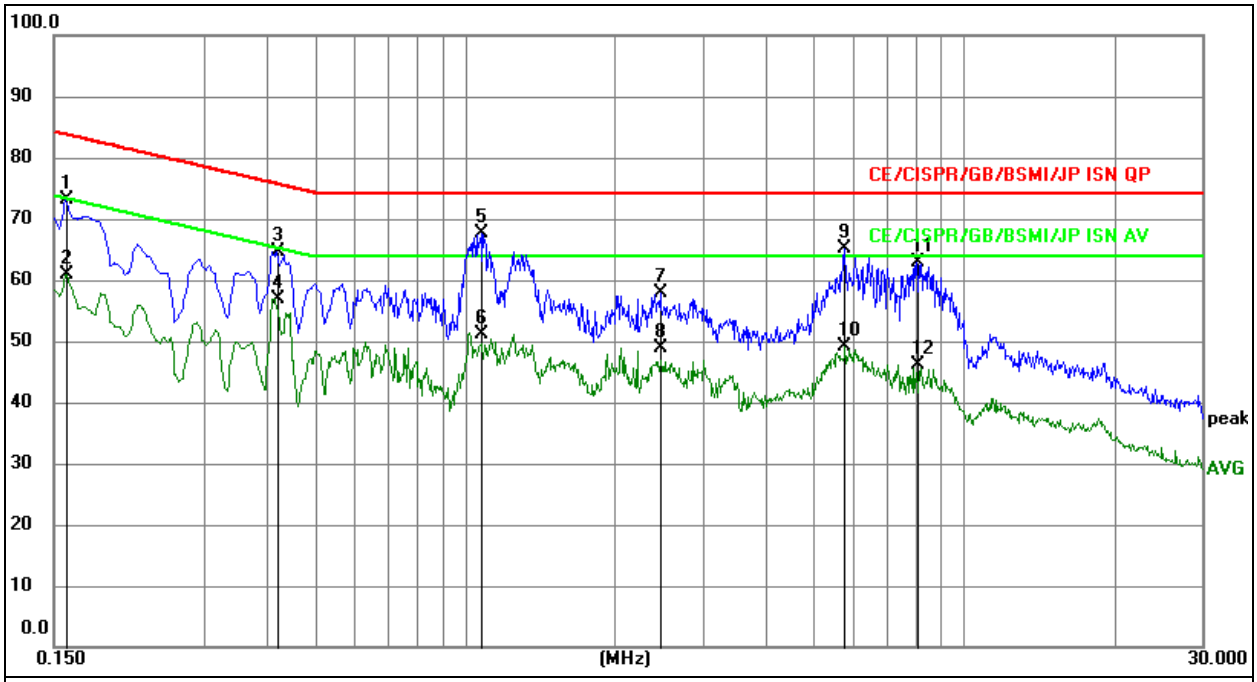
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	N
Test Mode:	The worst data(Mode 2)	Remark:	N/A



Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement=Reading Level+Correct Factor
4. Over=Measurement-Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.1500	36.41	20.07	56.48	66.00	-9.52	QP
2		0.1500	22.41	20.07	42.48	56.00	-13.52	AVG
3		0.4148	29.33	20.08	49.41	57.55	-8.14	QP
4	*	0.4148	22.75	20.08	42.83	47.55	-4.72	AVG
5		1.0430	20.93	20.09	41.02	56.00	-14.98	QP
6		1.0430	5.62	20.09	25.71	46.00	-20.29	AVG
7		2.3836	8.48	20.11	28.59	56.00	-27.41	QP
8		2.3836	-1.09	20.11	19.02	46.00	-26.98	AVG
9		5.7437	23.10	20.15	43.25	60.00	-16.75	QP
10		5.7437	7.40	20.15	27.55	50.00	-22.45	AVG
11		22.8965	20.50	20.31	40.81	60.00	-19.19	QP
12		22.8965	13.46	20.31	33.77	50.00	-16.23	AVG

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101kPa	Phase :	TELE
Test Mode:	RJ45 (2500Mbps)	Remark:	N/A



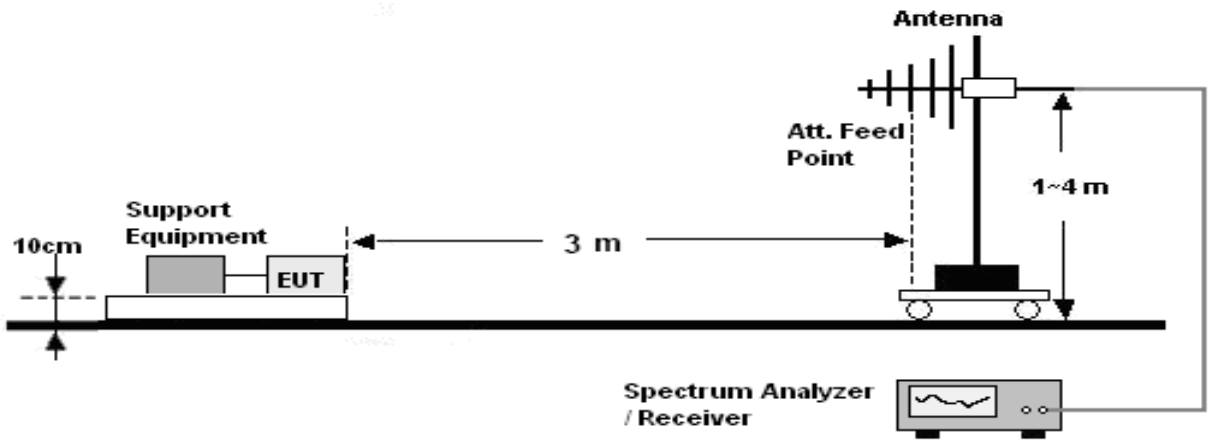
Remark:
1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.
3. Measurement=Reading Level+Correct Factor
4. Over=Measurement-Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz		dB	dBuV	dBuV	dB	Detector
1		0.1590	53.22	19.83	73.05	83.52	-10.47	QP
2		0.1590	40.93	19.83	60.76	73.52	-12.76	AVG
3		0.4200	44.82	19.90	64.72	75.45	-10.73	QP
4		0.4200	37.04	19.90	56.94	65.45	-8.51	AVG
5	*	1.0814	47.51	20.08	67.59	74.00	-6.41	QP
6		1.0814	31.04	20.08	51.12	64.00	-12.88	AVG
7		2.4720	37.85	20.01	57.86	74.00	-16.14	QP
8		2.4720	28.85	20.01	48.86	64.00	-15.14	AVG
9		5.7705	44.96	20.17	65.13	74.00	-8.87	QP
10		5.7705	29.07	20.17	49.24	64.00	-14.76	AVG
11		8.0250	42.69	20.26	62.95	74.00	-11.05	QP
12		8.0250	25.81	20.26	46.07	64.00	-17.93	AVG

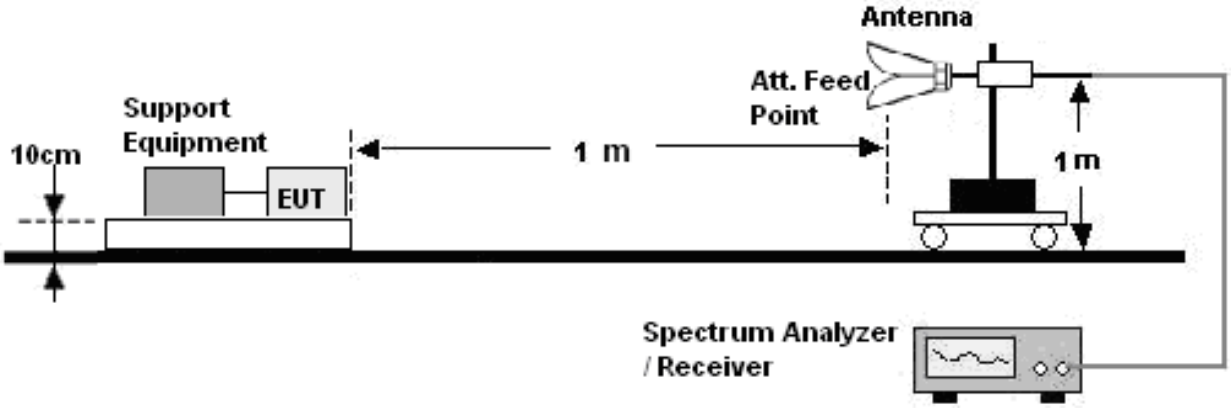
7. Radiated Emissions Test

7.1 Block Diagram Of Test Setup

30MHz ~ 1GHz:



Above 1GHz:



7.2 Limits

Limits for radiated disturbance of Class B MME

Frequency (MHz)	Quasi-peak limits at 3m dB(μV/m)	
30-230	40	
230-1000	47	
Frequency (GHz)	**limit above 1G at 3m dB(μV/m)**	
	Average	**peak**
1-3	50	70
3-6	54	74

Note: The lower limit shall apply at the transition frequencies.

7.3 Test Procedure

30MHz ~ 1GHz:
a. The Product was placed on the nonconductive turntable 0.8m above the ground in a semi anechoic chamber.
b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 120 kHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied between 1~4 m in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
c. For each frequency whose maximum record was higher or close to limit, measure its QP value: vary the antenna's height and rotate the turntable from 0 to 360 degrees to find the height and degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to QP Detector and specified bandwidth with Maximum Hold Mode, and record the maximum value.
Above 1GHz:
a. The Product was placed on the non-conductive turntable 0.8 m above the ground in a full anechoic chamber.
b. Set the spectrum analyzer/receiver in Peak detector, Max Hold mode, and 1MHz RBW. Record the maximum field strength of all the pre-scan process in the full band when the antenna is varied in both horizontal and vertical, and the turntable is rotated from 0 to 360 degrees.
c. For each frequency whose maximum record was higher or close to limit, measure its AV value: rotate the turntable from 0 to 360 degrees to find the degree where Product radiated the maximum emission, then set the test frequency analyzer/receiver to AV value and specified bandwidth with Maximum Hold Mode, and record the maximum value.

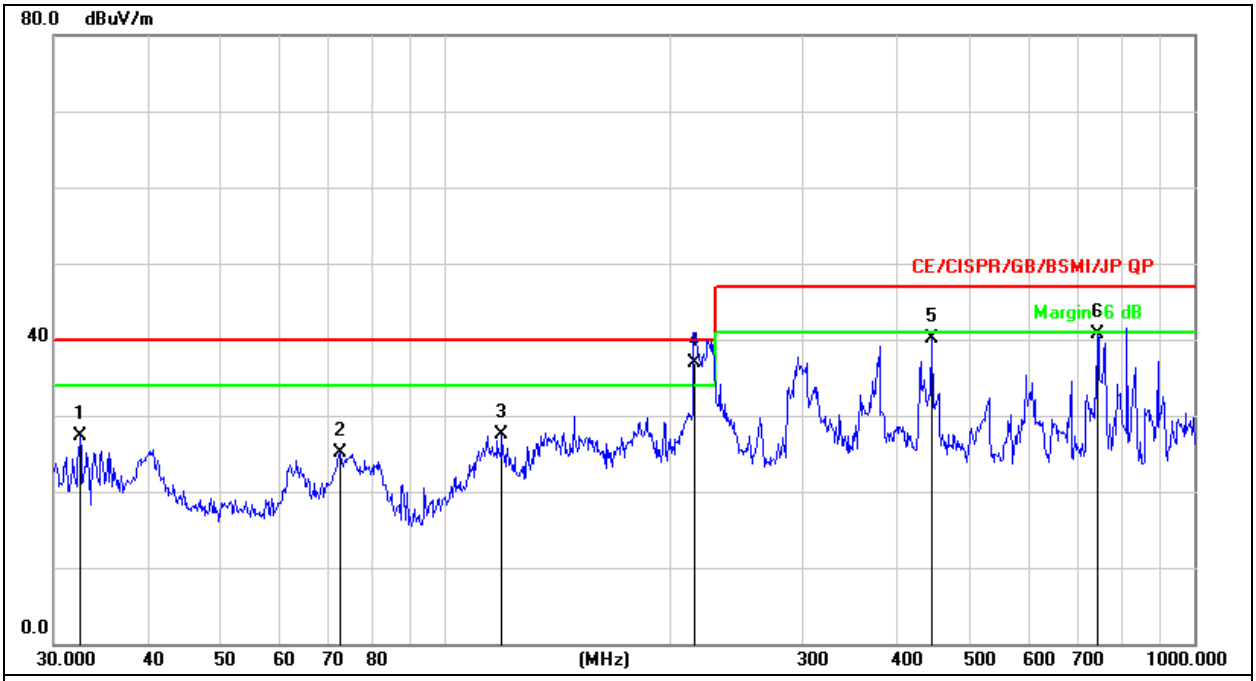
Above 1GHz

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

7.4 Test Results

Below 1GHz

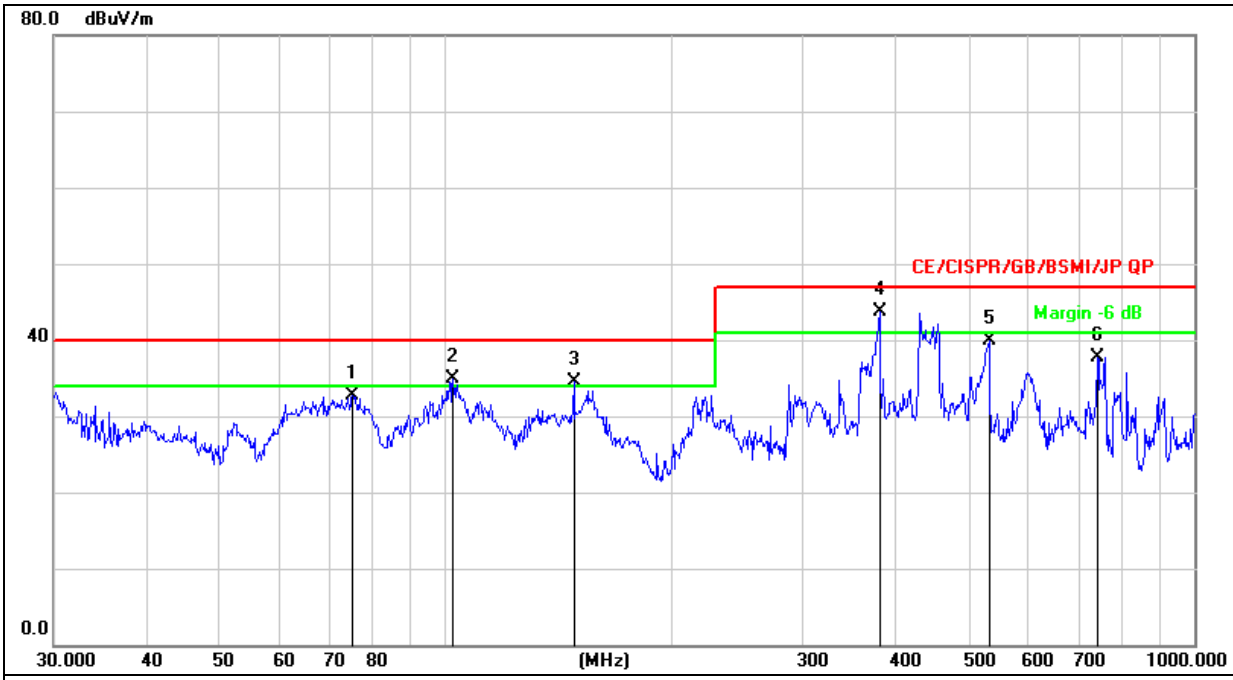
Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Horizontal
Test Mode:	The worst data(Mode 1)	Remark:	N/A



Remark:
1.Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement=Reading Level+Correct Factor
3. Over=Measurement-Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		32.5197	43.40	-16.16	27.24	40.00	-12.76	QP
2		72.3375	43.44	-18.41	25.03	40.00	-14.97	QP
3		119.0180	44.80	-17.26	27.54	40.00	-12.46	QP
4	*	215.2678	52.25	-15.28	36.97	40.00	-3.03	QP
5		446.4141	49.97	-9.93	40.04	47.00	-6.96	QP
6		742.2586	45.71	-5.10	40.61	47.00	-6.39	QP

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Phase :	Vertical
Test Mode:	The worst data(Mode 1)	Remark:	N/A

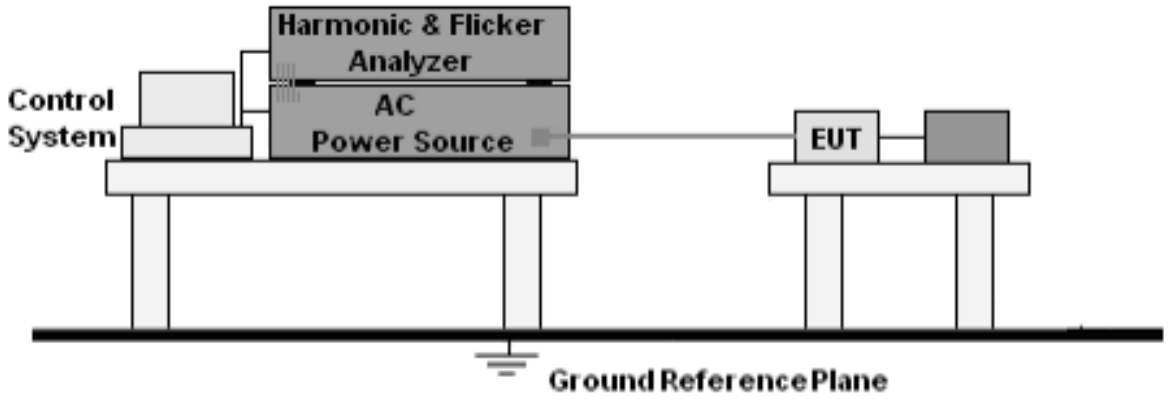


Remark:
1.Factor = Antenna Factor + Cable Loss – Pre-amplifier.
2. Measurement=Reading Level+Correct Factor
3. Over=Measurement-Limit

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		75.1821	51.58	-18.91	32.67	40.00	-7.33	QP
2	!	102.3597	50.90	-16.09	34.81	40.00	-5.19	QP
3	!	148.4410	53.89	-19.32	34.57	40.00	-5.43	QP
4	*	379.9141	54.85	-11.10	43.75	47.00	-3.25	QP
5		531.9633	49.66	-9.74	39.92	47.00	-7.08	QP
6		742.2586	42.86	-5.10	37.76	47.00	-9.24	QP

8. Harmonic Current Emission(H)

8.1 Block Diagram Of Test Setup



8.2 Limit

EN IEC 61000-3-2:2019+A1:2021

8.3 Test Procedure

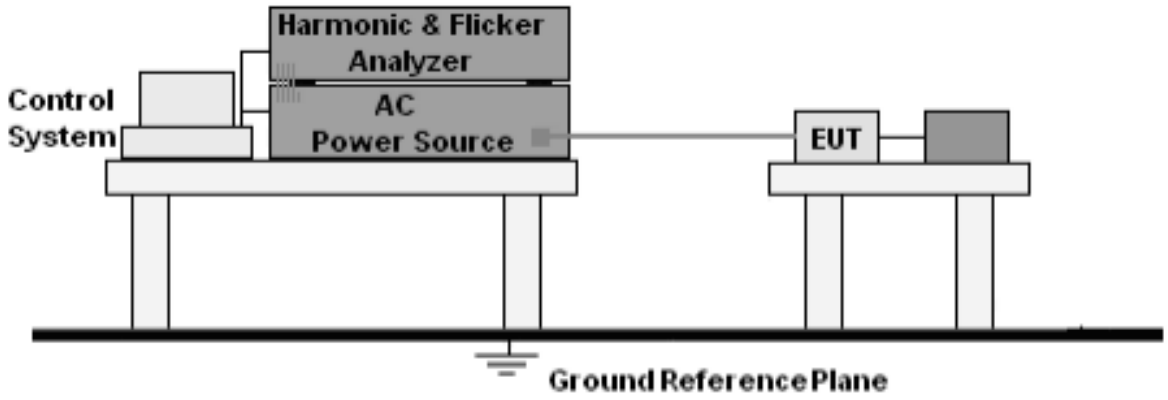
a. The Product was placed on the top of a non-conductive table above the ground and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.
b. The correspondent test program of test instrument to measure the current harmonics emanated from Product was chosen. The measure time shall be not less than the time necessary for the Product to be exercised.

8.4 Test Results

The EUT is powered by the DC only, the test item is not applicable.

9. Voltage Fluctuations & Flicker(F)

9.1 Block Diagram Of Test Setup



9.2 Limit

EN 61000-3-3:2013+A2:2021 Clause 5

9.3 Test Procedure

a. The Product was placed on the top of a non-conductive table above the ground and operated to produce the most unfavorable sequence of voltage changes under normal operating conditions.
b. During the flick test, the measure time shall include that part of whole operation cycle in which the Product produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

9.4 Test Results

The EUT is powered by the DC only, the test item is not applicable.

10. Immunity Test Of General The Performance Criteria

According To EN 301489 -3standard, The General Performance Criteria As Following:

Criteria	During the test	After the test
A	Operate as intended No loss of function No unintentional responses	Operate as intended No loss of function No degradation of performance No loss of stored data or user programmable functions
B	May show loss of function No unintentional responses	Operate as intended Lost function(s) shall be self-recoverable No degradation of performance No loss of stored data or user programmable functions

According To EN 301489 -17standard, The General Performance Criteria As Following:

Criteria	During test	After test (i.e. as a result of the application of the test)
A	Shall operate as intended. (see note). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data.
B	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.
NOTE: Operate as intended during the test allows a level of degradation in accordance with Minimum performance level. Minimum performance level: For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %. For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.		

PERFORMANCE FOR TT

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR TR

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR CT

The performance criteria A shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an Acknowledgement (ACK) or Not Acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR CR

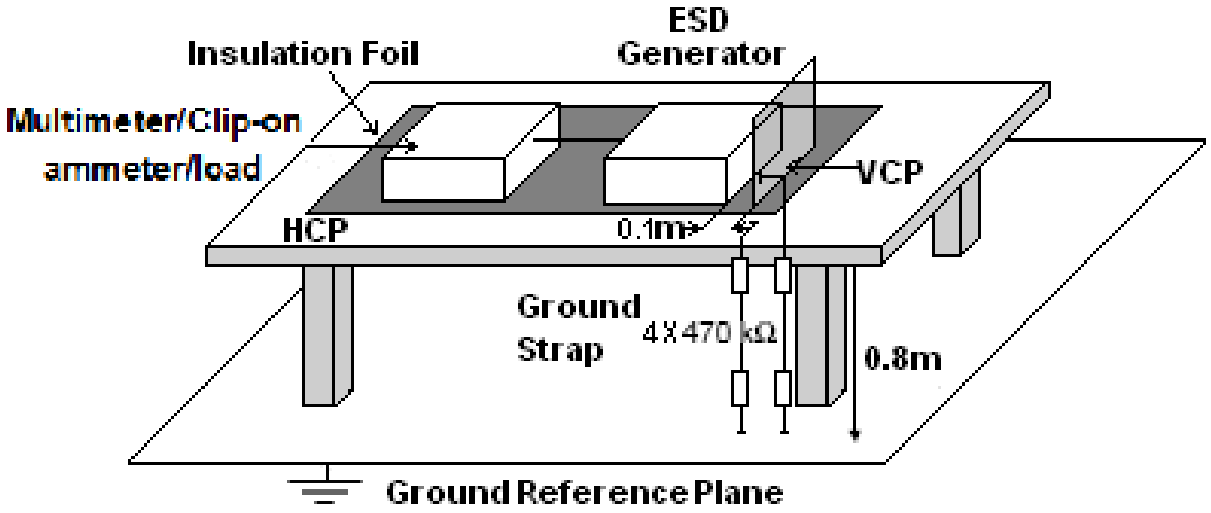
The performance criteria A shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

11. Electrostatic Discharge (ESD)

11.1 Test Specification

Test Port	:	Enclosure port
Discharge Impedance	:	330 ohm / 150 pF
Discharge Mode	:	Single Discharge
Discharge Period	:	one second between each discharge

11.2 Block Diagram Of Test Setup



11.3 Test Procedure

a. Electrostatic discharges were applied only to those points and surfaces of the Product that are accessible to users during normal operation.
b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
c. The time interval between two successive single discharges was at least 1 second.
d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the Product.
e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the Product as fast as possible (without causing mechanical damage) to touch the Product. After each discharge, the ESD generator was removed from the Product and re-triggered for a new single discharge. The test was repeated until all discharges were complete.

11.4 Test Results

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Mode:	Mode 1 & Mode 2 & Mode 3

Mode	**Air Discharge (Test result)**								**Contact Discharge (Test result)**								**Perform Criteria**	**Judgment**
Test level (kV)	2		4		8		15		2		4		6		8			
Test Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-		
HCP									A	A	A	A					TT,TR	PASS
VCP									A	A	A	A					TT,TR	PASS
Port									A	A	A	A					TT,TR	PASS

Note:

1) P/N denotes the Positive/Negative polarity of the output voltage.
2) Test condition:
Direct / Indirect (HCP/VCP) discharges: Minimum 50 times (Positive/Negative) at each point.
Air discharges: Minimum 10 times (Positive/Negative) at each point.
3) N/A - denotes test is not applicable in this test report
4)There was not any unintentional transmission in standby mode

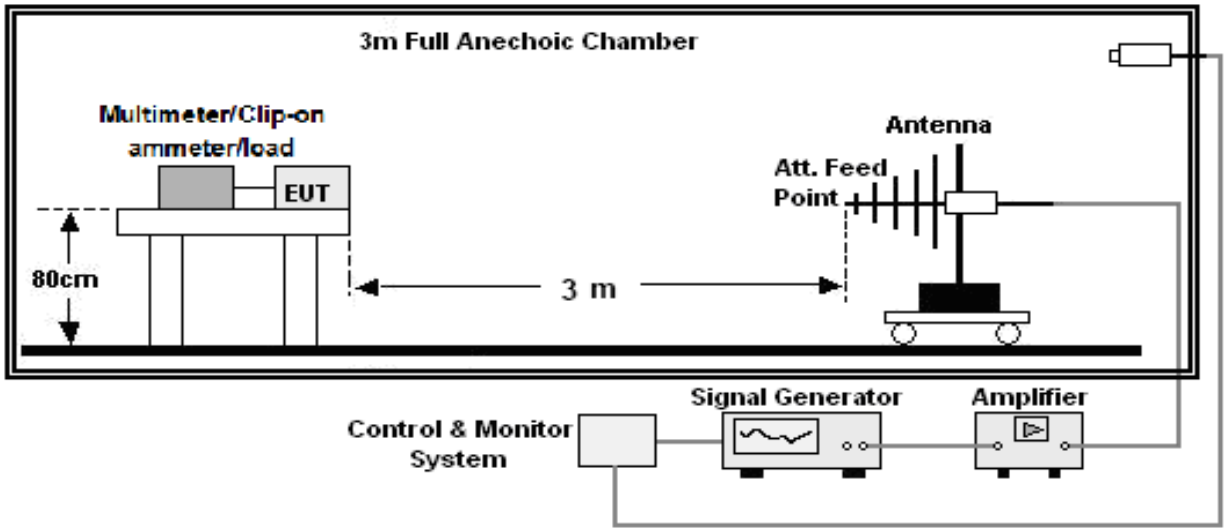
12. Continuous RF Electromagnetic Field Disturbances(RS)

12.1 Test Specification

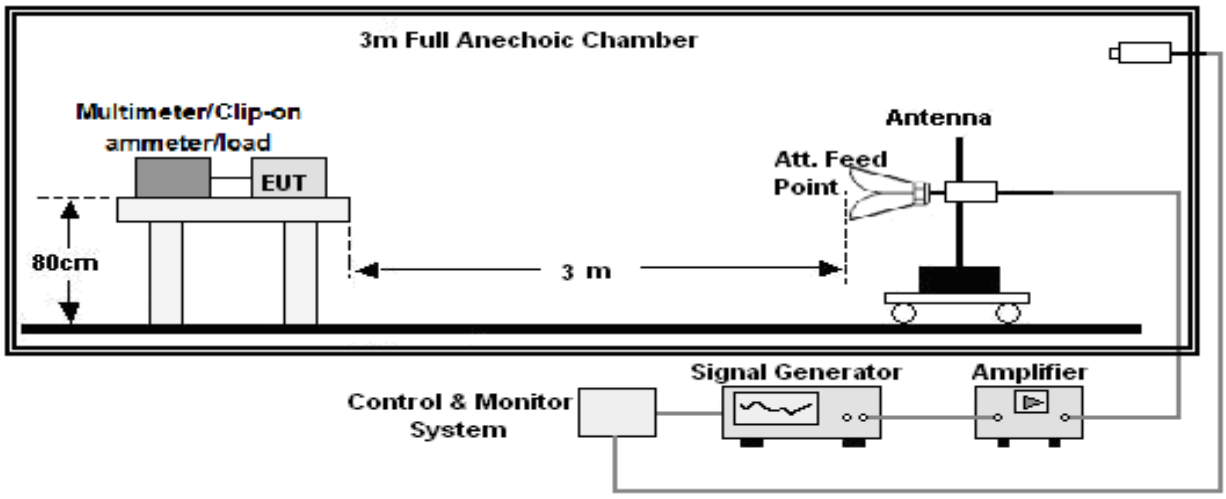
Test Port	:	Enclosure port
Step Size	:	1%
Modulation	:	1kHz, 80% AM
Dwell Time	:	1 second
Polarization	:	Horizontal & Vertical

12.2 Block Diagram Of Test Setup

Below 1GHz:



Above 1GHz:



12.3 Test Procedure

a. The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the Product.
b. The frequency range is swept from 80MHz to 6000MHz, with the signal 80% amplitude modulated with a 1 kHz sine wave, and the step size was 1%.
c. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond, but should not exceed 5 s at each of the frequencies during the scan.
d. The test was performed with the Product exposed to both vertically and horizontally polarized fields on each of the four sides.
e. For Broadcast reception function: Group 2 not apply in this test.

12.4 Test Results

Temperature:	26 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Mode:	Mode 1 & Mode 2 & Mode 3

Frequency Range	RF Field Position	R.F. Field Strength	Azimuth	Perform Criteria	Test Result	Judgment
80~6000	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	CT,CR	A	PASS
			Rear			
			Left			
			Right			

Note:

1) P/N denotes the Positive/Negative polarity of the output voltage.
2) N/A - denotes test is not applicable in this test report.
3) There was no change operated with initial operating during the test.
4) There was not any unintentional transmission in standby mode

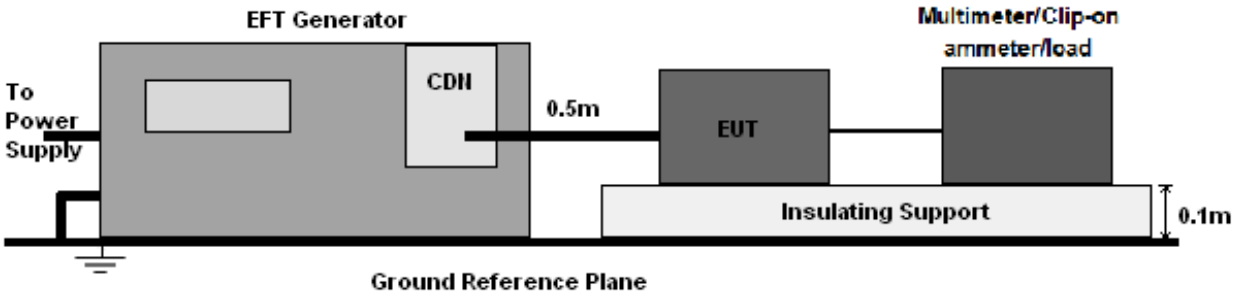
13. Electrical Fast Transients/Burst (EFT)

13.1 Test Specification

Test Port	:	input AC/DC power port
Impulse Frequency	:	5 kHz
Impulse Wave-shape	:	5/50 ns
Burst Duration	:	15 ms
Burst Period	:	300 ms
Test Duration	:	2 minutes per polarity

13.2 Block Diagram Of EUT Test Setup

For input AC/DC power port:



13.3 Test Procedure

a. The Product and support units were located on a non-conductive table above ground reference plane.
b. A 0.5m-long power cord was attached to Product during the test.

13.4 Test Results

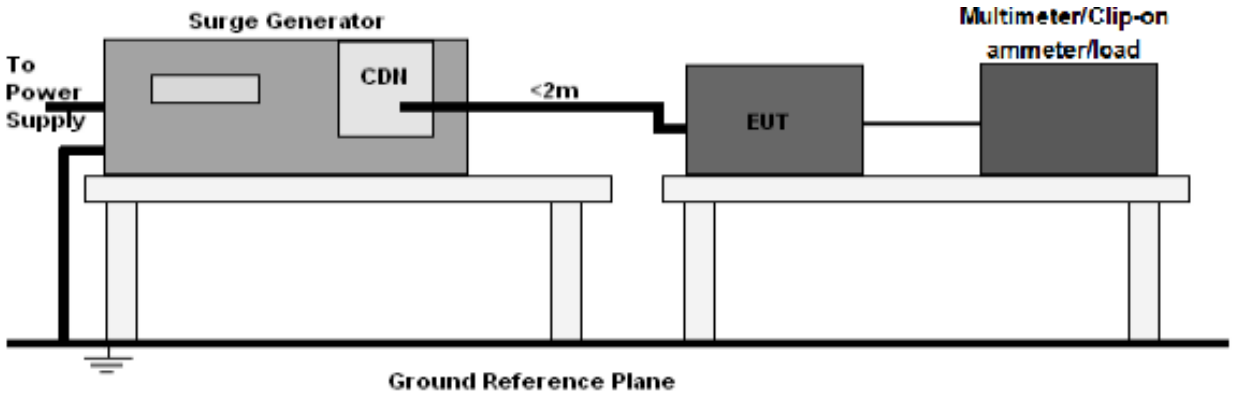
The EUT is powered by the DC only, the test item is not applicable.

14. Surges Immunity Test

14.1 Test Specification

Test Port	:	input AC/DC power port
Wave-Shape	:	Open Circuit Voltage - 1.2 / 50 us Short Circuit Current - 8 / 20 us
Pulse Repetition Rate	:	1 pulse / min.
Phase Angle	:	0° / 90° / 180° / 270°
Test Events	:	5 pulses (positive & negative) for each polarity

14.2 Block Diagram Of EUT Test Setup



14.3 Test Procedure

a. The surge is to be applied to the Product power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave.
b. The power cord between the Product and the coupling/decoupling networks shall be 2 meters in length (or shorter). Interconnection line between the Product and the coupling/decoupling networks shall be 2 meters in length (or shorter).

14.4 Test Result

The EUT is powered by the DC only, the test item is not applicable.

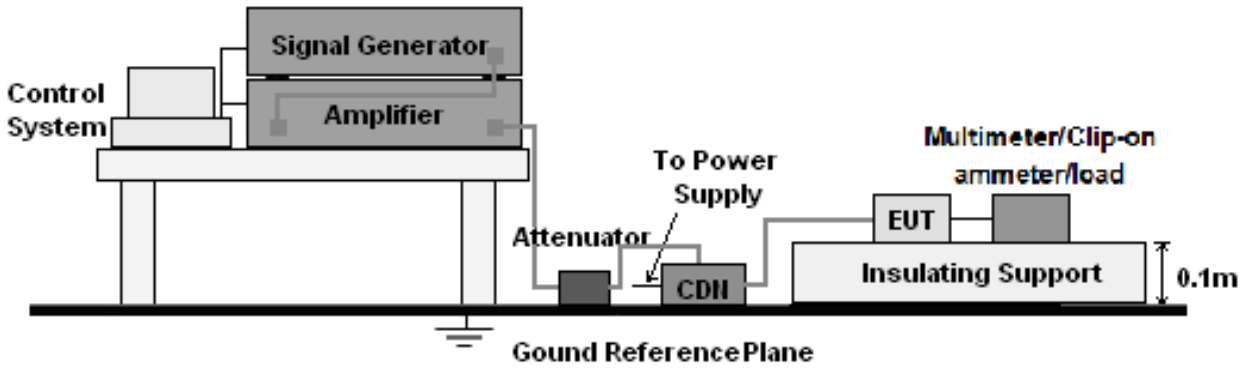
15. Continuous Induced RF Disturbances (CS)

15.1 Test Specification

Test Port	:	input AC/DC. power port analogue/digital data port
Step Size	:	1%
Modulation	:	1kHz, 80% AM
Dwell Time	:	1 second

15.2 Block Diagram Of EUT Test Setup

For input AC/DC power port:



15.3 Test Procedure

For input AC/DC power port:
a. The Product and support units were located at a ground reference plane with the interposition of a 0.1 m thickness insulating support and the CDN was located on GRP directly.
b. The frequency range is swept from 150 kHz to 10MHz, 10MHz to 30MHz, 30MHz to 80MHz with the signal 80% amplitude modulated with a 1 kHz sine wave, and the step size was 1% of fundamental.
c. The dwell time at each frequency shall be not less than the time necessary for the Product to be able to respond.

15.4 Test Result

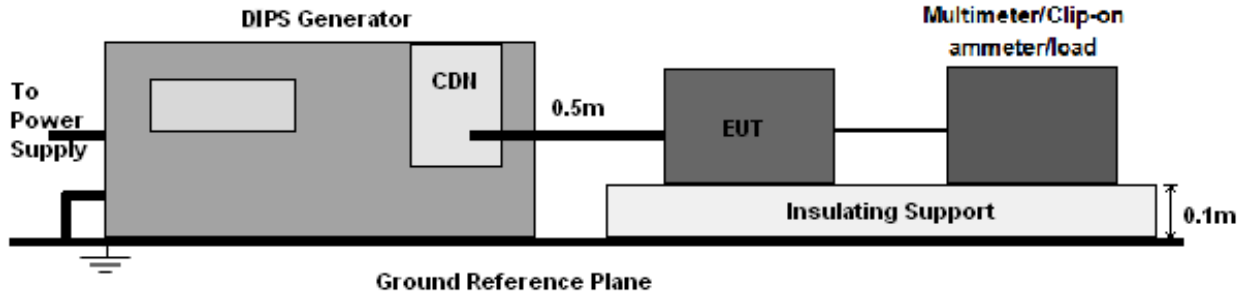
The EUT is powered by the DC only, the test item is not applicable.

16. Voltage Dips And Interruptions (DIPS)

16.1 Test Specification

Test Port	:	input AC power port
Phase Angle	:	0°, 180°
Test cycle	:	3 times

16.2 Block Diagram Of EUT Test Setup



16.3 Test Procedure

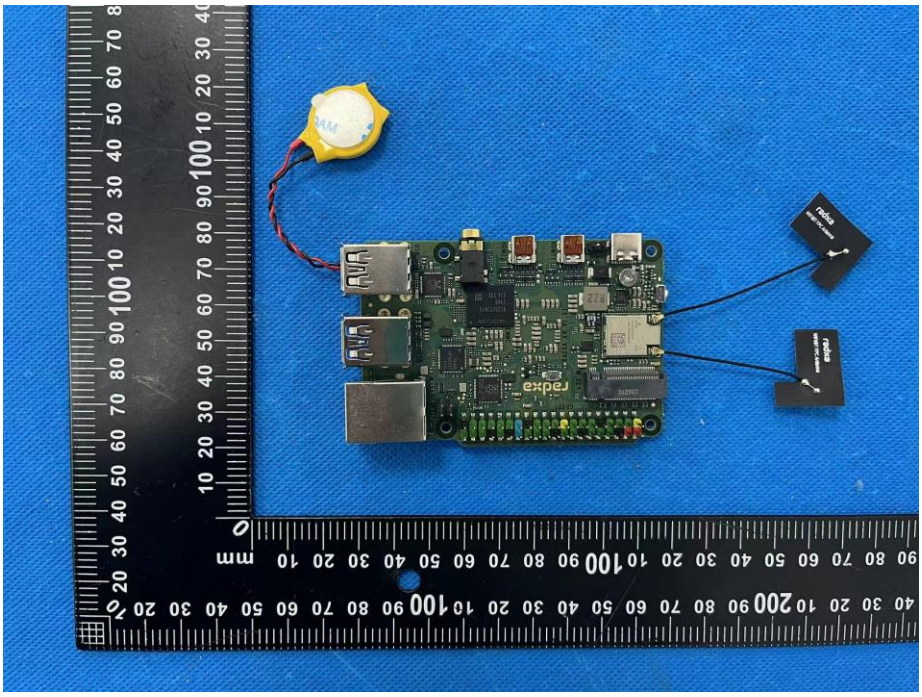
a. The Product and support units were located on a non-conductive table above ground floor.
b. Set the parameter of tests and then perform the test software of test simulator.
c. Conditions changes to occur at 0 degree crossover point of the voltage waveform.

16.4 Test Result

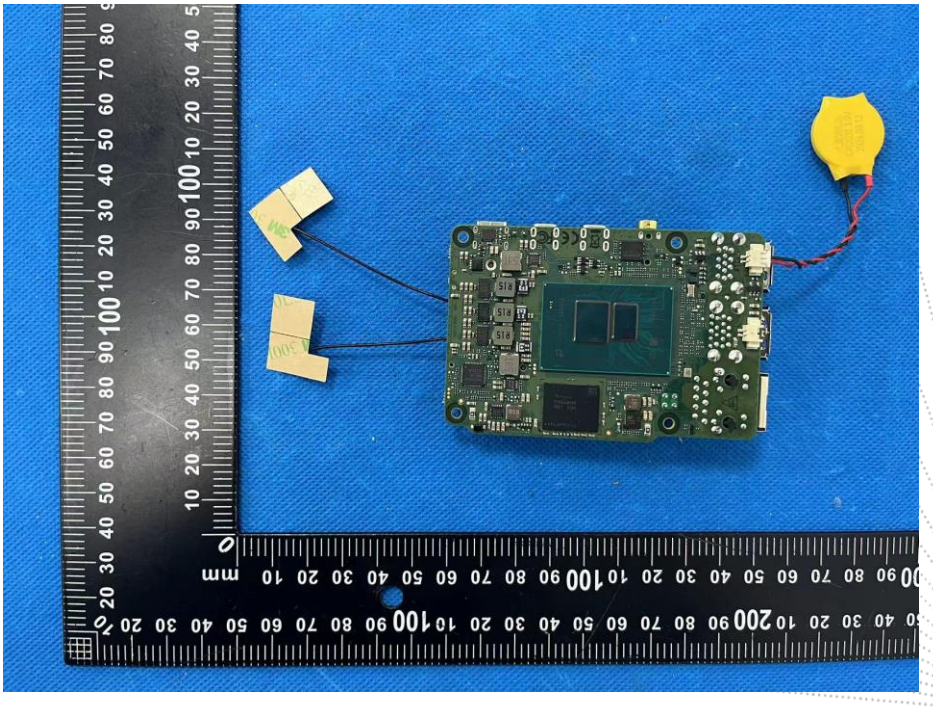
The EUT is powered by the DC only, the test item is not applicable.

17. EUT Photographs

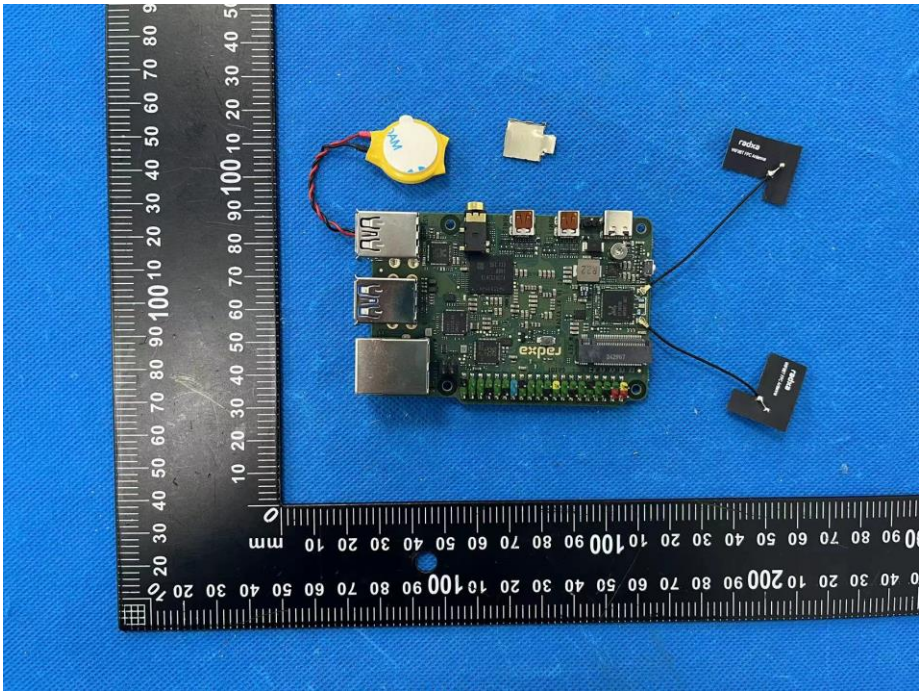
EUT Photo 1



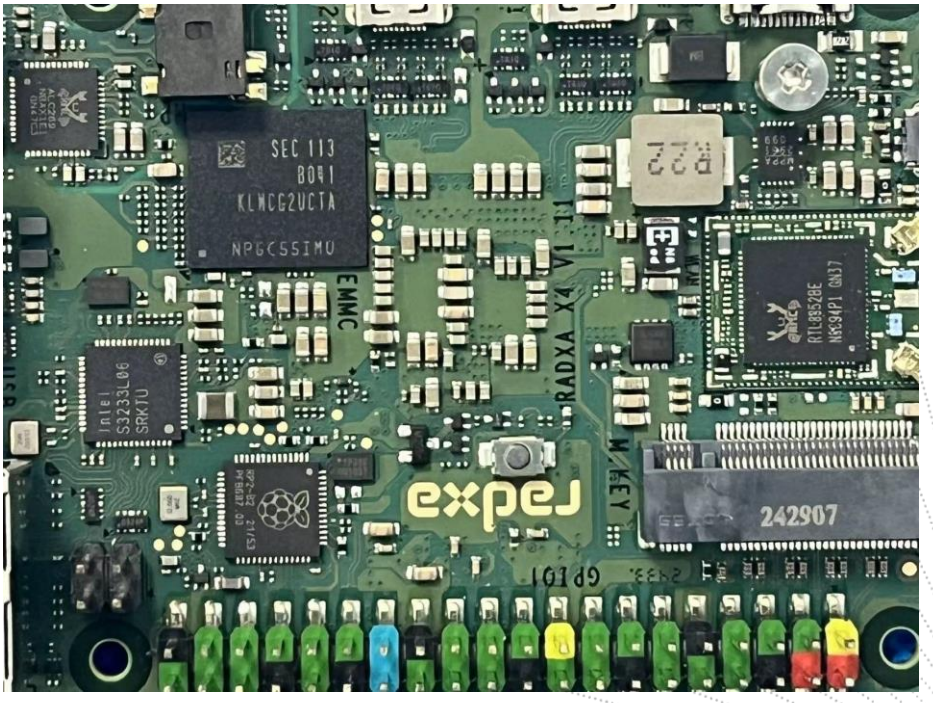
EUT Photo 2



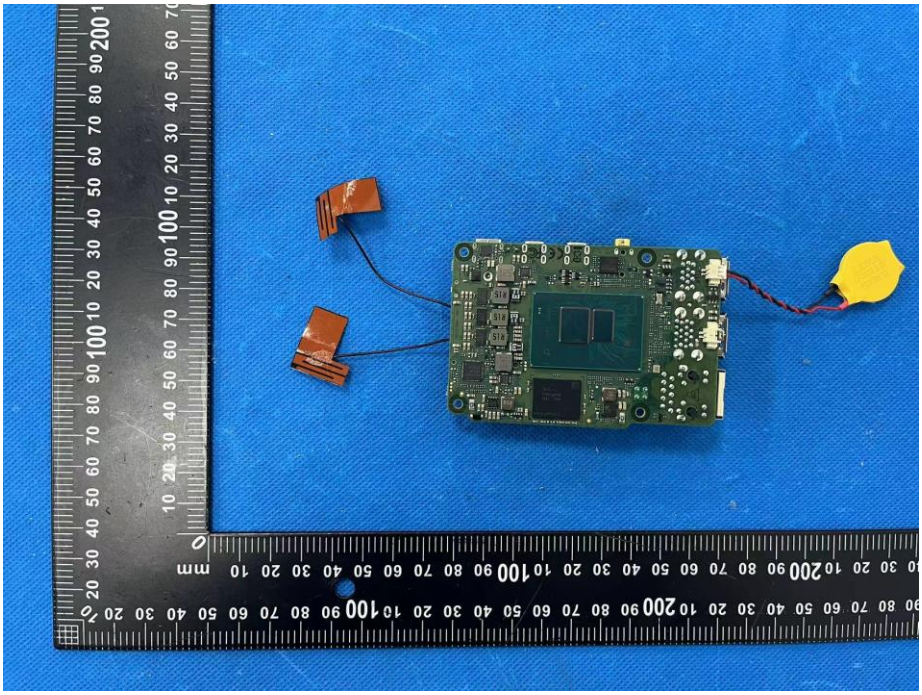
EUT Photo 3



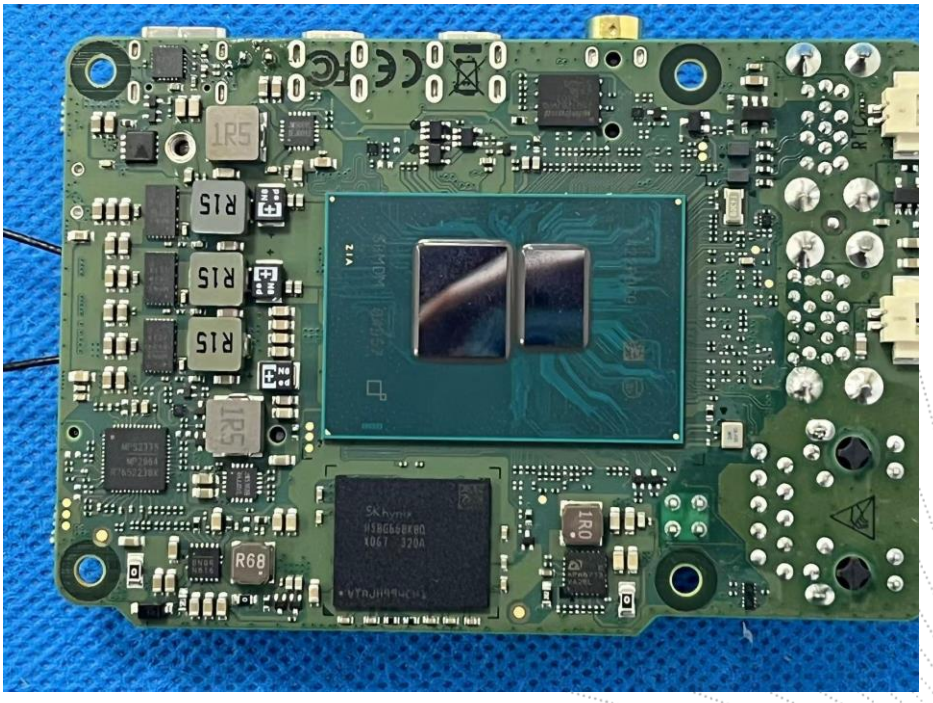
EUT Photo 4



EUT Photo 5



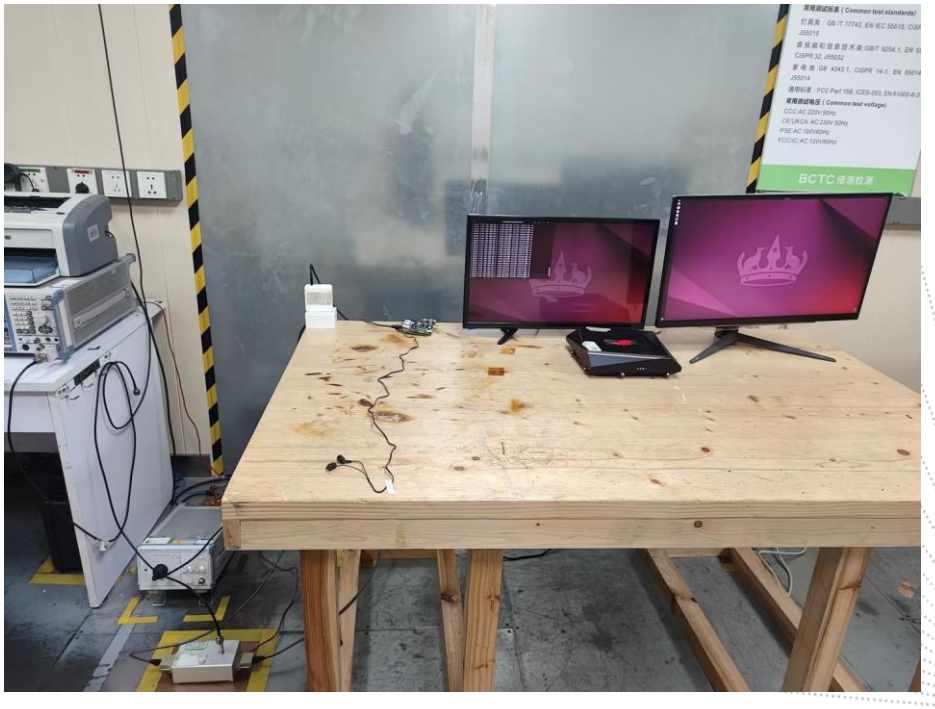
EUT Photo 6



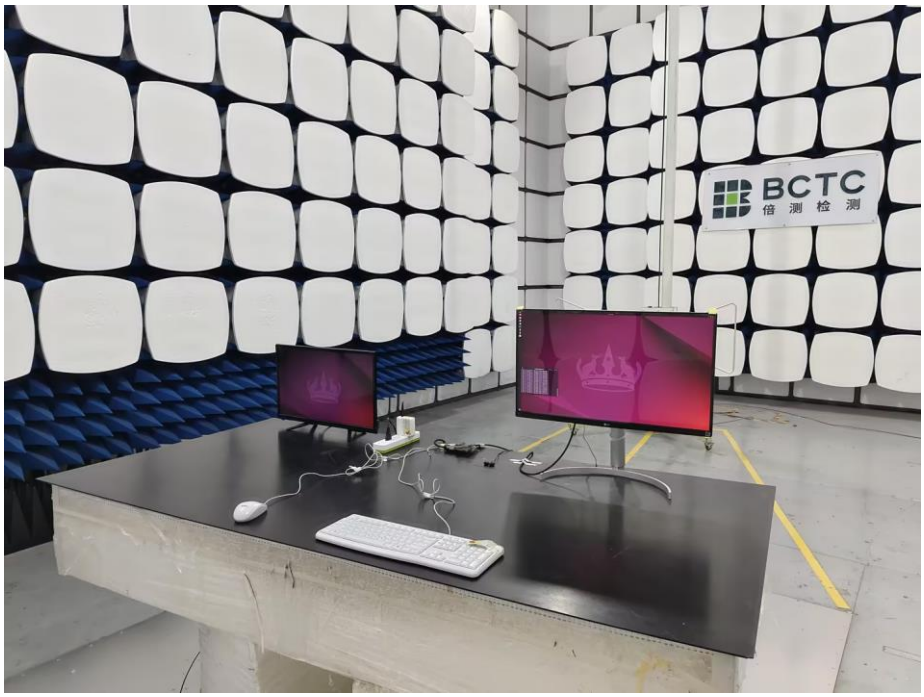
18. EUT Test Setup Photographs

Conducted emissions

TELE

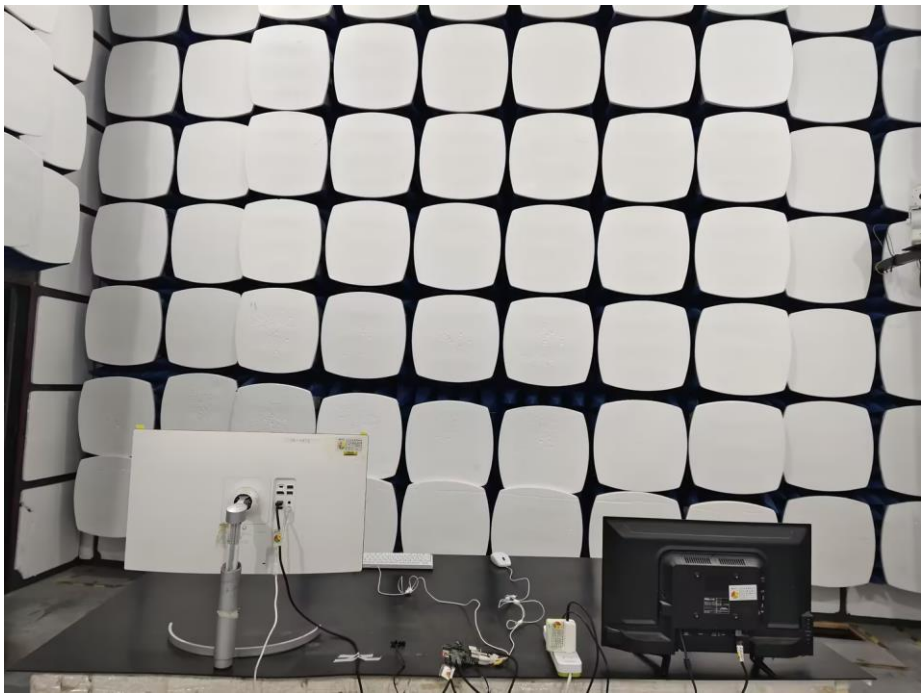


Radiated emissions



ESD

RS



STATEMENT

1. The equipment lists are traceable to the national reference standards.

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without the "special seal for inspection and testing".

4. The test report is invalid without the signature of the approver.

5. The test process and test result is only related to the Unit Under Test.

6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.

7. The quality system of our laboratory is in accordance with ISO/IEC17025.

8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

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TEL: 400-788-9558

P.C.: 518103

FAX: 0755-33229357

Website: http://www.chnbctc.com

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Complaint/Advice E-mail: advice@bctc-lab.com.cn

※※※※※ END ※※※※※