TEST REPORT

Product	:	Industrial Cellular Router
Trade mark	:	WLINK
Model/Type reference	:	WL-R230, WL-R230-LFX, WL-R230-LA, WL-R230-LG
Serial Number	:	N/A
Report Number	:	EED32Q800356
Date of Issue	:	Mar. 12, 2024
Test Standards	:	ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-17 V3.2.4 (2020-09) ETSI EN 301 489-19 V2.2.1 (2022-09) ETSI EN 301 489-52 V1.2.1 (2021-11)
Test result	:	PASS

Prepared for:

Shenzhen Wlink Technology Co., LTD
2A, F5 Building, TCL International E-City, No.1001 Zhongshanyuan Road, Nanshan District, Shenzhen, China, 518052

Prepared by:

Centre Testing International Group Co., Ltd.
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Approved by: Aaron Ma Date of Issue: Mar. 12, 2024

Aaron Ma Check No.:4150100124

2 Version

Version No.	Date	Description
00	Mar. 12, 2024	Original

3 Test Summary

Electromagnetic Compatibility (EMC) Part				
Electromagnetic Interference (EMI)				
Test	**Test Requirement**	**Test Method**	**Limit**	**Result**
Radiated Emission	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.1, ETSI EN 301 489-19 V2.2.1 (2022-09) Clause 7.1, ETSI EN 301 489-52 V1.2.1 (2021-11)Clause 7.2.1	EN 301 489-1 V2.2.3 (2019-11) Clause 8.2	Clause 8.2.3	PASS
Conducted Emission (DC port)	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.1, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.1, ETSI EN 301 489-52 V1.2.1 (2021-11)Clause 7.2.1	EN 301 489-1 V2.2.3 (2019-11) Clause 8.3	Clause 8.3.3	N/A[1]
Conducted Emission (AC port)	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.1, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.1, ETSI EN 301 489-52 V1.2.1 (2021-11)Clause 7.2.1	EN 301 489-1 V2.2.3 (2019-11) Clause 8.4	Clause 8.4.3	PASS
Harmonic Emission on AC, 50Hz to 2kHz	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.1, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.1, ETSI EN 301 489-52 V1.2.1 (2021-11)Clause 7.2.1	EN 301 489-1 V2.2.3 (2019-11) Clause 8.5	Clause 8.5	N/A[2]
Flicker Emission on AC	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.1, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.1, ETSI EN 301 489-52 V1.2.1 (2021-11)Clause 7.2.1	EN 301 489-1 V2.2.3 (2019-11) Clause 8.6	Clause 8.6	PASS
Conducted Emission (telecommunication port)	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.1, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.1, ETSI EN 301 489-52 V1.2.1 (2021-11)Clause 7.2.1	EN 301 489-1 V2.2.3 (2019-11) Clause 8.7	Clause 8.7.3	PASS
Electromagnetic Susceptibility(EMS)				
ESD (Electrostatic Discharge)	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1 (2021-11) Clause 7.3.1	EN 301 489-1 V2.2.3 (2019-11) Clause 9.3	Clause 9.3.3	PASS
Radiated Immunity, 80MHz to 6 GHz	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1 (2021-11) Clause 7.3.1	EN 301 489-1 V2.2.3 (2019-11) Clause 9.2	Clause 9.2.3	PASS

EFT (Electrical Fast Transients)	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1 (2021-11) Clause 7.3.1	EN 301 489-1 V2.2.3 (2019-11) Clause 9.4	Clause 9.4.3	PASS
Surge Immunity	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1 (2021-11) Clause 7.3.1	EN 301 489-1 V2.2.3 (2019-11) Clause 9.8	Clause 9.8.3	PASS
Injected Currents 150kHz to 80MHz	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1 (2021-11) Clause 7.3.1	EN 301 489-1 V2.2.3 (2019-11) Clause 9.5	Clause 9.5.3	PASS
Voltage Dips and Interruptions	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1 (2021-11) Clause 7.3.1	EN 301 489-1 V2.2.3 (2019-11) Clause 9.7	Clause 9.7.3	PASS
Transients and Surges in the Vehicular Environment	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1 (2021-11) Clause 7.3.1	EN 301 489-1 V2.2.3 (2019-11) Clause 9.6	Clause 9.6.3	N/A[3]

Remark:
Company Name and Address shown on Report, the sample(s) and sample Information was/ were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.
Tx: In this whole report Tx (or tx) means Transmitter.
Rx: In this whole report Rx (or rx) means Receiver.
RF: In this whole report RF means Radiated Frequency.
CH: In this whole report CH means channel.
Volt: In this whole report Volt means Voltage.
Temp: In this whole report Temp means Temperature.
Humid: In this whole report Humid means humidity.
Press: In this whole report Press means Pressure.
N/A: In this whole report not application.
N/A[1)] The tested sample has no DC mains input/output port , therefore it is not applicable.
N/A[2)] The Product belongs to Class B, and its power is less than 75W, so it deems to fulfil this standard without testing.
N/A[3)] The tested sample is not used in the vehicle, therefore it is not applicable.

4 Contents

5 General Information

5.1 Client Information

Applicant:	Shenzhen Wlink Technology Co., LTD
Address of Applicant:	2A, F5 Building, TCL International E-City, No.1001 Zhongshanyuan Road, Nanshan District, Shenzhen, China, 518052
Manufacturer:	Shenzhen Wlink Technology Co., LTD
Address of Manufacturer:	2A, F5 Building, TCL International E-City, No.1001 Zhongshanyuan Road, Nanshan District, Shenzhen, China, 518052

5.2 Product Specification subjective to this standard

Product Name:	Industrial Cellular Router	
Mode No.(EUT):	WL-R230, WL-R230-LFX, WL-R230-LA, WL-R230-LG	
Model difference:	All models are identical except for the Markets and models name are different. The test model is WL-R230, the test results are applicable to the others.	
Trade Mark:	WLINK	
Test Voltage:	AC 230V/50Hz	
Test Mode:		
Mode a	Wifi mode:	Keep the EUT in Wifi mode.
Mode b	Standby mode:	Keep the EUT in standby mode.
Mode c	GPS mode:	Keep the EUT in GPS mode.
Mode d	2G mode:	Keep the EUT in 2G mode.
Mode e	3G mode:	Keep the EUT in 3G mode.
Mode f	4G mode:	Keep the EUT in 4G mode.
Mode g	Idle mode:	Keep the EUT in Idle mode.

5.3 Other Information

Sample Received Date:	Jan. 13, 2024
Sample tested Date:	Jan. 13, 2024 to Feb. 05, 2024

5.4 Description of Support Units

The EUT has been tested independently.

support equipment

No.	Device Type	Brand	Model	Series No.	Data Cable	Power Cord
1.	---	---	---	---	---	---

5.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax:+86 (0) 755 33683385

No tests were sub-contracted.

CNAS-Lab Code: L1910

5.6 Deviation from Standards

None.

5.7 Abnormalities from Standard Conditions

None.

5.8 Other Information Requested by the Customer

None.

5.9 Monitoring of EUT for the Immunity Test

Visual: Monitoring the Mode a to Mode g of EUT.

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

No.	Item	Measurement Uncertainty
1	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
2	Radiated emission	4.9dB (30MHz-1GHz)
		4.7dB (1GHz-6GHz)
3	Temperature test	0.64°C
4	Humidity test	3.8%
5	DC power test	0.026%

6 Equipment List

Shielding Room No. 3 - Conducted disturbance Test				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
Receiver	R&S	ESCI	100435	04/14/2024
LISN	R&S	ENV216	100098	03/01/2024
ISN	TESEQ	ISN T800	30297	12/28/2024
ISN	R&S	NTFM 8158	NTFM 8158 #91	07/28/2024

3M Semi-anechoic Chamber (2)- Radiated emissions Test				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05/21/2025
Receiver	R&S	ESCI7	100938-003	10/13/2024
TRILOG Broadband Antenna	schwarzbeck	VULB 9163	401	10/15/2024
Multi device Controller	maturo	NCD/070/10711112	---	---
Horn Antenna	ETS-LINGREN	BBHA 9120D	9120D-1869	04/16/2024
Microwave Preamplifier	Agilent	8449B	3008A02425	06/22/2024

Shielding Room No. 2 - Flicker Test (EN 61000-3-3) Shielding Room No. 2 –Voltage dips and interruptions Test (IEC 61000-4-11)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
AC / DC programmable regulated power supply	EM TEST	Net Wave 30	P1613178144	06/12/2024
Single / three phase scintillation simulator	EM TEST	503N32	P1613178045	06/12/2024
Three phase harmonic and scintillation analyzer	EM TEST	DPA 503N	P154516605	06/12/2024
Voltage dip simulator	EM TEST	PFS 503N32.2	P1919229535	04/06/2024

Shielding Room No. 1 - ESD Test (IEC 61000-4-2)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
ESD Simulator	TESEQ	NSG437	1182	06/09/2024

3M Full-anechoic Chamber - Continuous RF electromagnetic radiated field disturbances Test (IEC 61000-4-3)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
3M Chamber &	ETS-LINDGREN	FACT-3	3510	05/19/2025

Accessory Equipment				
Signal Generator	R&S	SMB 100B	103084	05/19/2024
Power Probe	R&S	NRP6A	103342	07/12/2024
Power Probe	R&S	NRP6A	103343	07/13/2024
Power Amplifier	R&S	BBA 150-BC500	104743	06/06/2024
Power Amplifier	BONN	BLMA 1060-100	2113427	08/24/2024
RF switch	R&S	OSP220	102205	---
Directional coupler	BONN	BDC 1060-40/500	2128343-04	12/02/2024
Stacked double Log.-Per. Antenna	schwarzbeck	STLP 9128 E special	9128ES-110	---
Horn Antenna	schwarzbeck	STLP 9149	0776	05/21/2024

Shielding Room No. 3 - EFT / Surges Test (IEC 61000-4-4) (IEC 61000-4-5)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
Compact Generator	EM-Test	UCS500M/6B	V0603101093	04/14/2024

Shielding Room No. 2 - Continuous induced RF disturbances Test (IEC 61000-4-6)				
Equipment	**Manufacturer**	**Model**	**Serial No.**	**Due Date**
Conducted immunity test system	TESEQ	NSG 4070C-80	59089	08/26/2024
CDN	TESEQ	CDNE M210	59083	09/13/2024
CDN	TESEQ	CDNE M310	59040	09/13/2024
Attenuator	BIRD	75-A-MFN-06	0543	08/03/2024

7 EMC Requirements Specification

7.1 EMI (Emission)

7.1.1 Radiated Emission

Test Requirement: ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.1,
ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.1,
ETSI EN 301 489-52 V1.2.1 (2021-11) Clause 7.2.1

Test Method: EN 301 489-1 V2.2.3 (2019-11) Clause 8.2

EUT Operation:

Ambient: Temp.: 22°C Humid.: 51% Press.: 1010mbar

Test Mode: Mode a to Mode g

Test Status: Pretest the EUT at different test mode and found the Mode a which is worst case, the test worst case mode is recorded in the report.

Receive Setup:

Frequency range (MHz)	Detector	RBW	VBW
30-1000	Quasi-peak	120kHz	300kHz
Above 1000	Peak	1MHz	3MHz

Limit:

Frequency	Limit(@3m)	Remark
30MHz-230MHz	40dBuv/m	QP value
230MHz-1GHz	47dBuv/m	QP value
1GHz-3GHz	50dBuv/m	Average value
	70dBuv/m	PK value
3GHz-6GHz	54dBuv/m	Average value
	74dBuv/m	PK value

Test Setup:

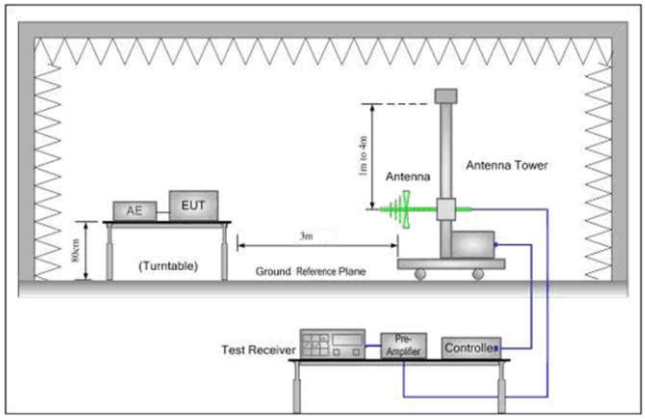


Figure 1. 30MHz to 1GHz

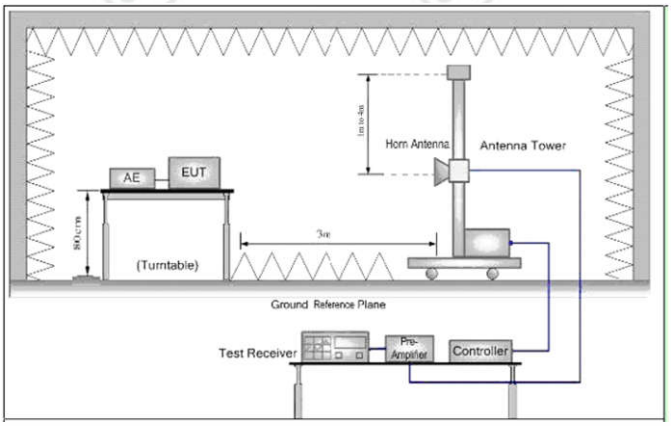


Figure 2. Above 1 GHz

Test Procedure:

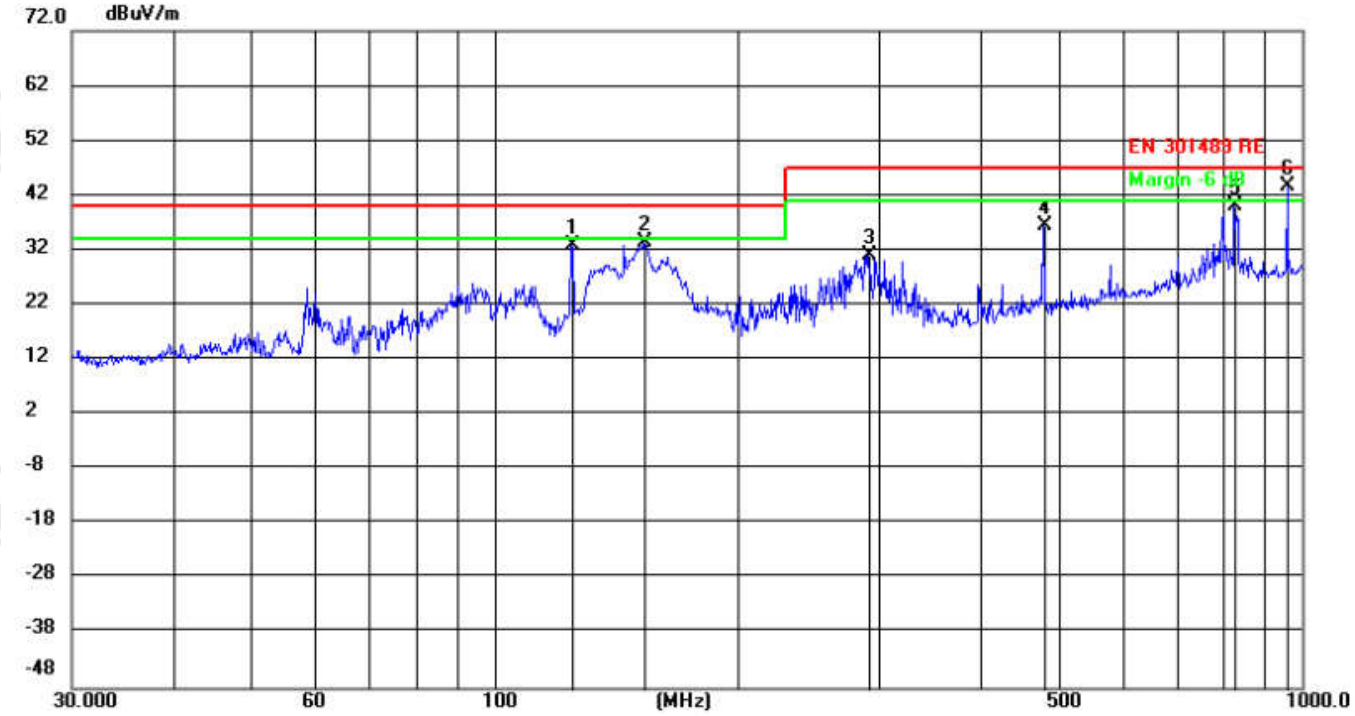
1. From 30 MHz to1GHz test procedure as below:
1) The radiated emissions were tested in a semi-anechoic chamber.
2) The EUT is placed on a turntable, which is 0.8m above ground plane.
3) The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4) EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
5) Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6) And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7) Repeat above procedures until the measurements for all frequencies are complete.
2. Above 1GHz test procedure as below:
1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber

Equipment Used: Refer to section 6 for details.

Test result: PASS

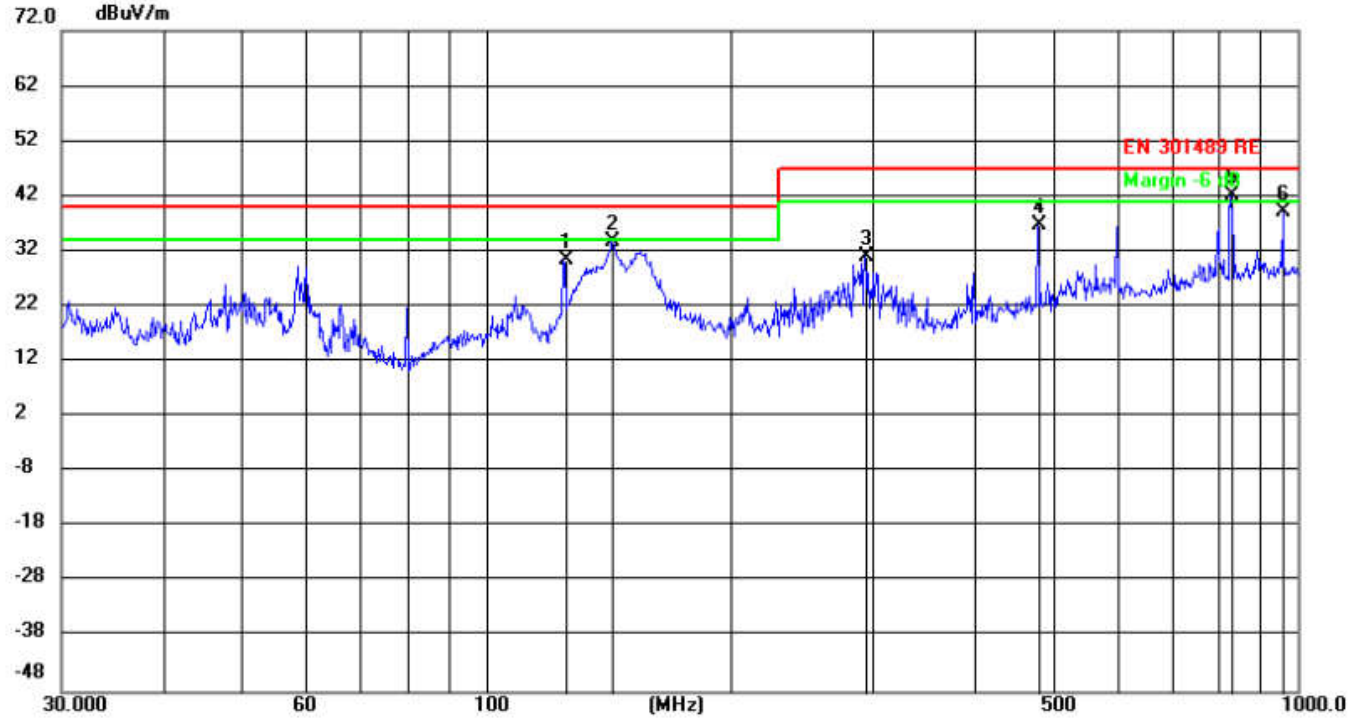
Measurement Data:
Below 1GHz（QP）：

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		125.0065	21.78	10.94	32.72	40.00	-7.28	QP	199	293	
2		153.7385	23.63	9.92	33.55	40.00	-6.45	QP	199	7	
3		291.0358	14.75	16.31	31.06	47.00	-15.94	QP	100	258	
4		480.0223	16.05	20.46	36.51	47.00	-10.49	QP	199	102	
5		824.8860	13.97	26.21	40.18	47.00	-6.82	QP	100	352	
6	*	960.1400	15.77	27.77	43.54	47.00	-3.46	QP	100	216	

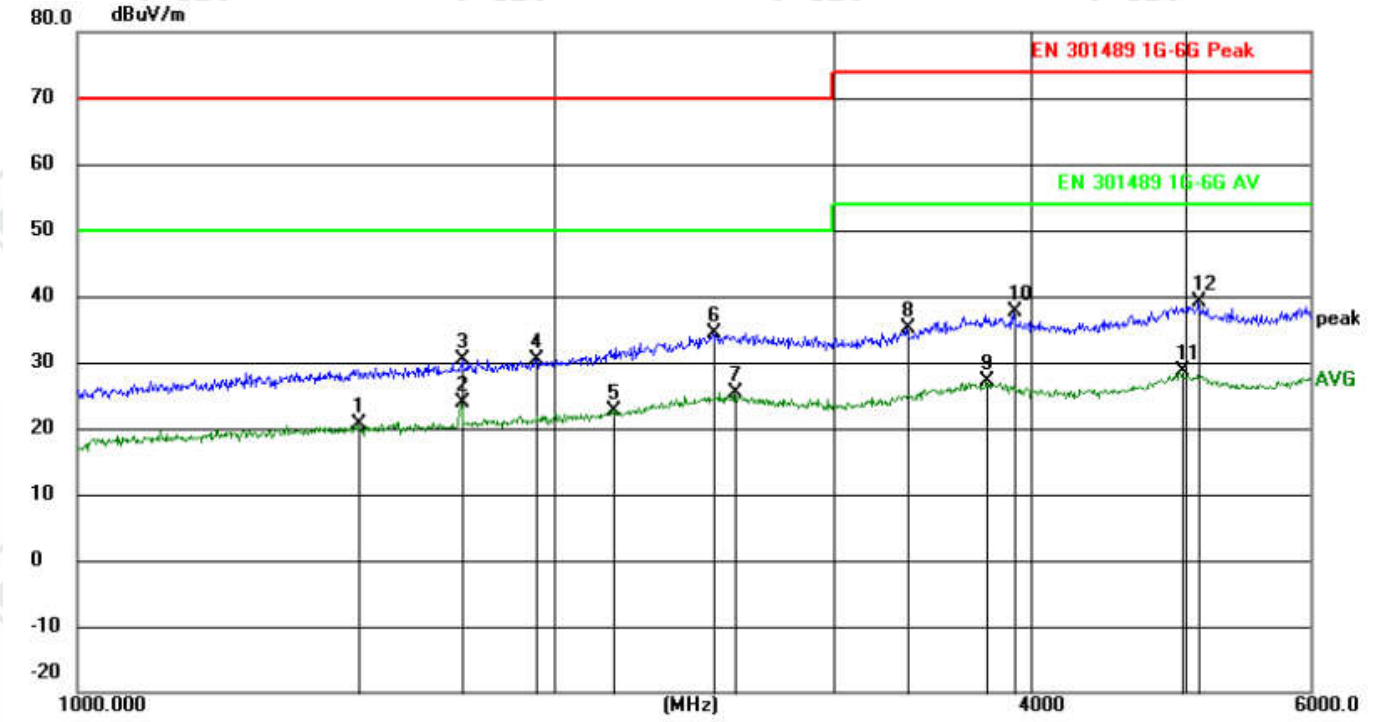
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		125.0066	19.40	10.94	30.34	40.00	-9.66	QP	100	104	
2		143.0750	24.26	9.62	33.88	40.00	-6.12	QP	100	251	
3		293.3413	14.57	16.41	30.98	47.00	-16.02	QP	200	226	
4		480.0224	16.24	20.46	36.70	47.00	-10.30	QP	100	230	
5	*	828.5096	15.82	26.27	42.09	47.00	-4.91	QP	200	78	
6		960.1401	11.26	27.77	39.03	47.00	-7.97	QP	100	177	

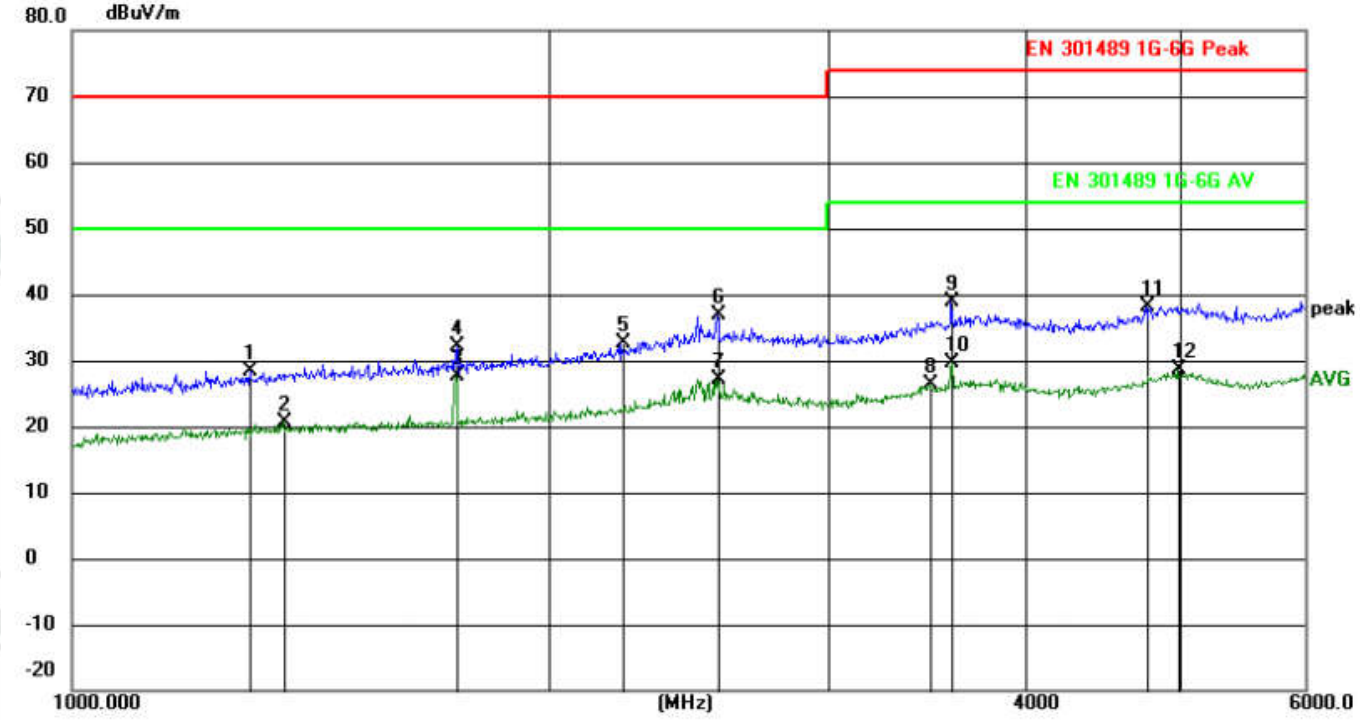
Above 1GHz:

Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		1504.052	35.53	-14.98	20.55	50.00	-29.45	AVG	200	12	
2		1750.384	37.10	-13.13	23.97	50.00	-26.03	AVG	100	335	
3		1750.541	43.58	-13.13	30.45	70.00	-39.55	peak	100	216	
4		1948.349	42.08	-11.64	30.44	70.00	-39.56	peak	200	0	
5		2179.026	32.92	-10.17	22.75	50.00	-27.25	AVG	199	148	
6		2521.406	42.44	-8.15	34.29	70.00	-35.71	peak	100	182	
7	*	2601.020	33.17	-7.86	25.31	50.00	-24.69	AVG	199	0	
8		3340.508	39.96	-4.71	35.25	74.00	-38.75	peak	199	352	
9		3750.094	30.53	-3.52	27.01	54.00	-26.99	AVG	100	97	
10		3904.716	40.84	-3.26	37.58	74.00	-36.42	peak	100	182	
11		4971.909	28.92	-0.36	28.56	54.00	-25.44	AVG	100	352	
12		5101.860	39.25	-0.04	39.21	74.00	-34.79	peak	199	182	

Vertical:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		1296.329	44.97	-16.55	28.42	70.00	-41.58	peak	200	159	
2		1360.706	36.61	-16.07	20.54	50.00	-29.46	AVG	100	7	
3	*	1746.781	40.80	-13.17	27.63	50.00	-22.37	AVG	200	312	
4		1749.443	45.33	-13.15	32.18	70.00	-37.82	peak	100	24	
5		2224.989	42.56	-9.90	32.66	70.00	-37.34	peak	199	211	
6		2555.060	44.97	-8.02	36.95	70.00	-33.05	peak	199	211	
7		2555.060	35.15	-8.02	27.13	50.00	-22.87	AVG	199	211	
8		3481.360	30.35	-4.04	26.31	54.00	-27.69	AVG	100	159	
9		3593.859	42.62	-3.79	38.83	74.00	-35.17	peak	199	159	
10		3594.181	33.51	-3.79	29.72	54.00	-24.28	AVG	199	159	
11		4771.179	39.00	-0.91	38.09	74.00	-35.91	peak	100	126	
12		4989.758	28.86	-0.31	28.55	54.00	-25.45	AVG	200	312	

Note:
1. Margin=Measurement-Limit.
2. Measurement=Reading_Level+Correct Factor.
3. Correct Factor=Ant Factor+Cable loss.

7.1.2 Conducted Emission

1) For AC Main Port

Test Requirement: ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.1,
ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.1,
ETSI EN 301 489-52 V1.2.1 (2021-11) Clause 7.2.1

Test Method: EN 301 489-1 V2.2.3 (2019-11) Clause 8.4

Detector: Peak for pre-scan (9kHz Resolution Bandwidth)
Quasi-Peak if maximized peak within 6dB of Quasi-Peak limit

EUT Operation:

Ambient: Temp.: 24°C Humid.: 55% Press.: 1010 mbar

Test Mode: Mode a to Mode g

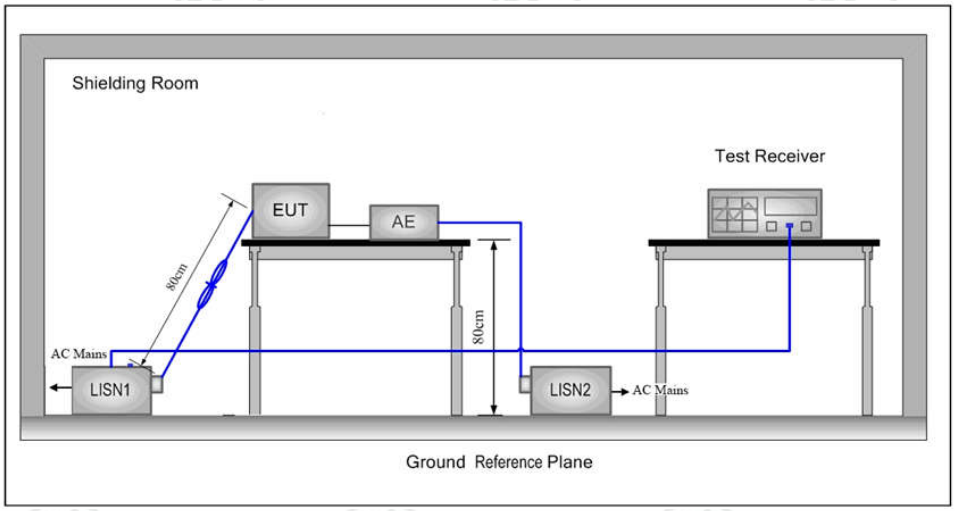
Test Status: Pretest the EUT at different test mode and found the Mode a which is worst case, the test worst case mode is recorded in the report.

Equipment Used: Refer to section 6 for details.

Limit: Limits for conducted disturbance at the mains ports of class B

Frequency Range (MHz)	Class B Limit (dBμV)	
	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
NOTE 1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz. NOTE 2: The lower limit is applicable at the transition frequency.		

Test Setup:



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 50Ω/50μH + 5Ω 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.

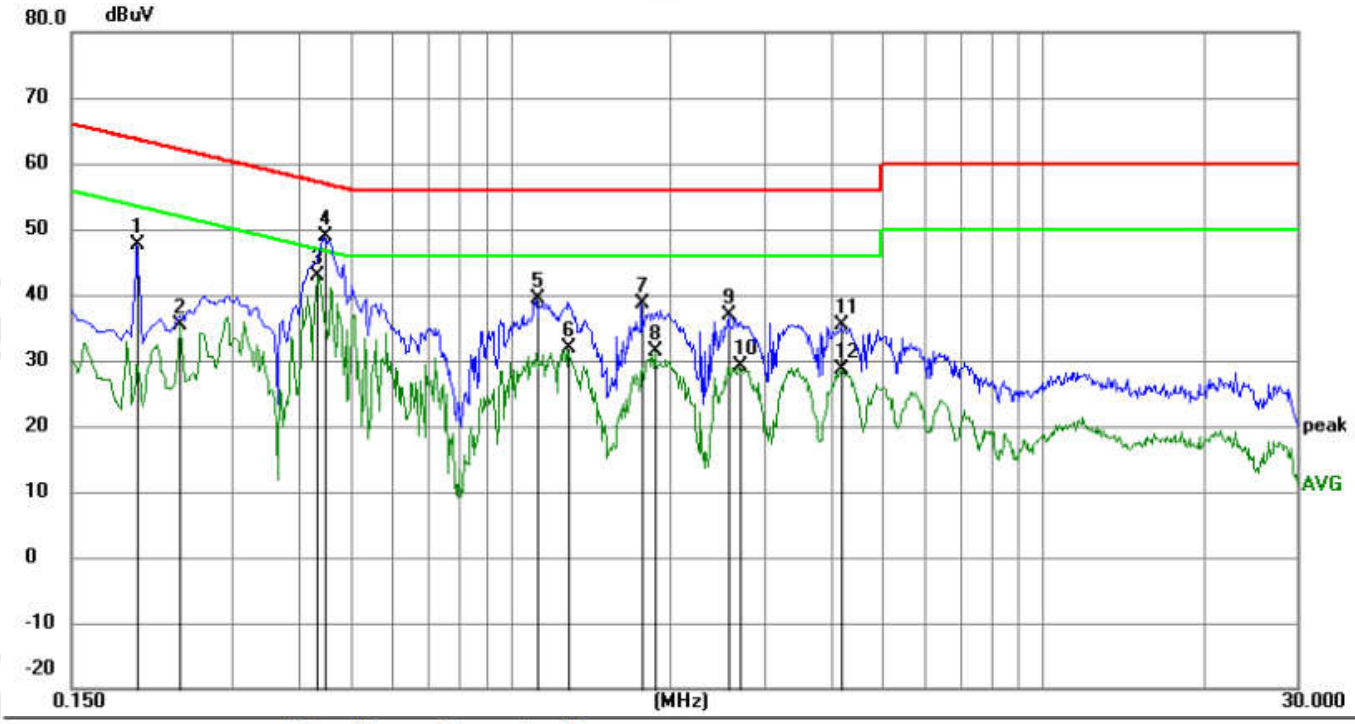
Test result: PASS

Measurement Data:

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

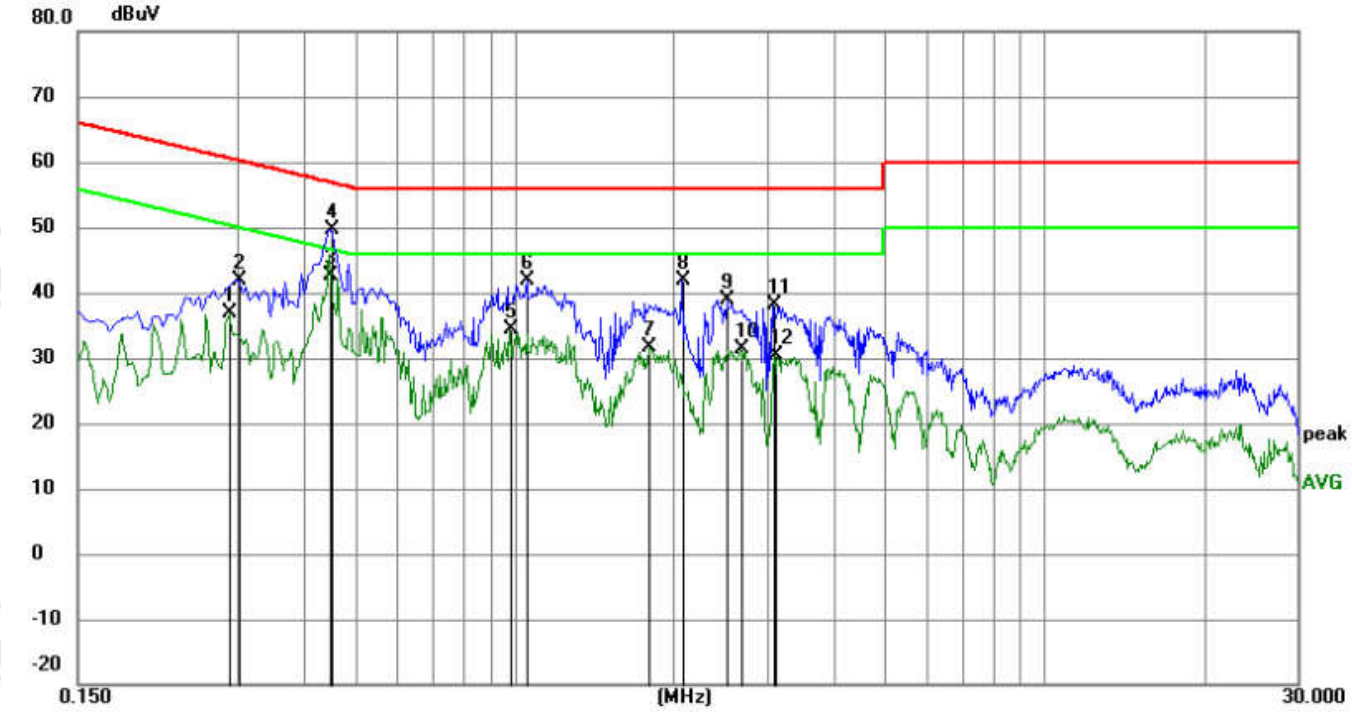
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:



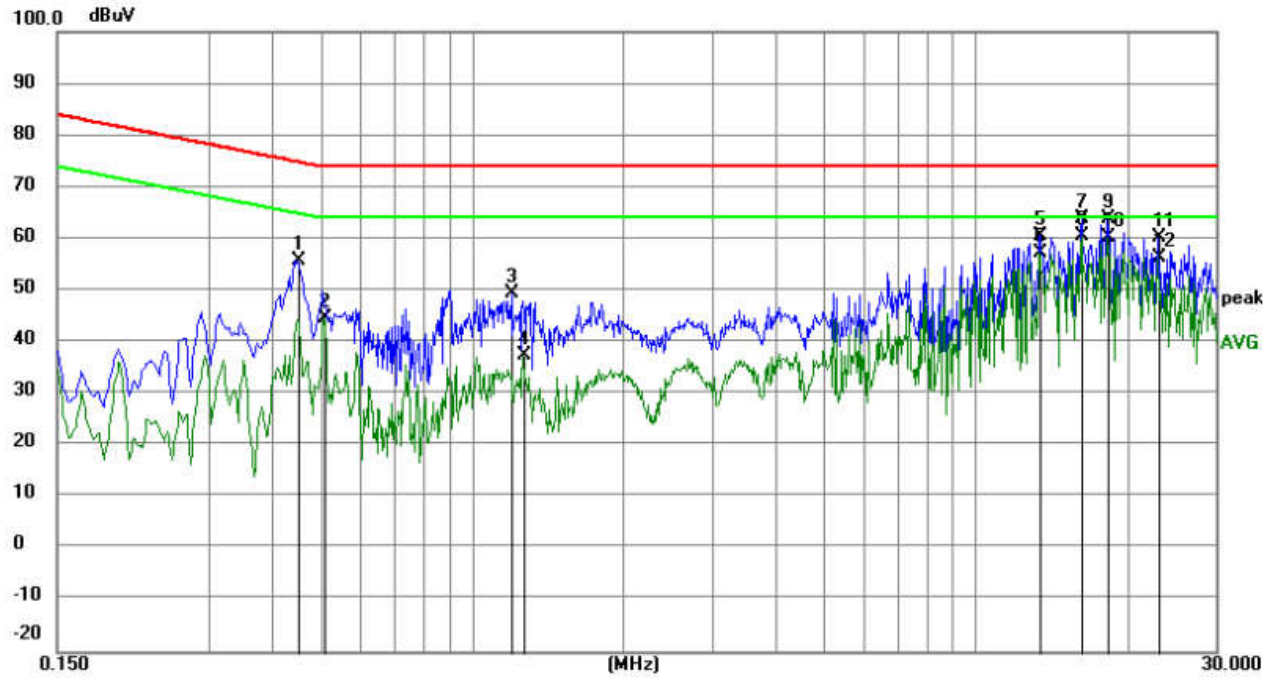
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1995	37.73	9.92	47.65	63.63	-15.98	QP	
2		0.2400	25.68	9.77	35.45	52.10	-16.65	AVG	
3	*	0.4335	32.99	9.79	42.78	47.19	-4.41	AVG	
4		0.4470	39.01	9.79	48.80	56.93	-8.13	QP	
5		1.1220	29.54	9.74	39.28	56.00	-16.72	QP	
6		1.2839	22.16	9.74	31.90	46.00	-14.10	AVG	
7		1.7655	28.82	9.75	38.57	56.00	-17.43	QP	
8		1.8735	21.54	9.75	31.29	46.00	-14.71	AVG	
9		2.5755	27.07	9.77	36.84	56.00	-19.16	QP	
10		2.6970	19.45	9.77	29.22	46.00	-16.78	AVG	
11		4.1955	25.44	9.82	35.26	56.00	-20.74	QP	
12		4.1955	18.85	9.82	28.67	46.00	-17.33	AVG	

Neutral Line:



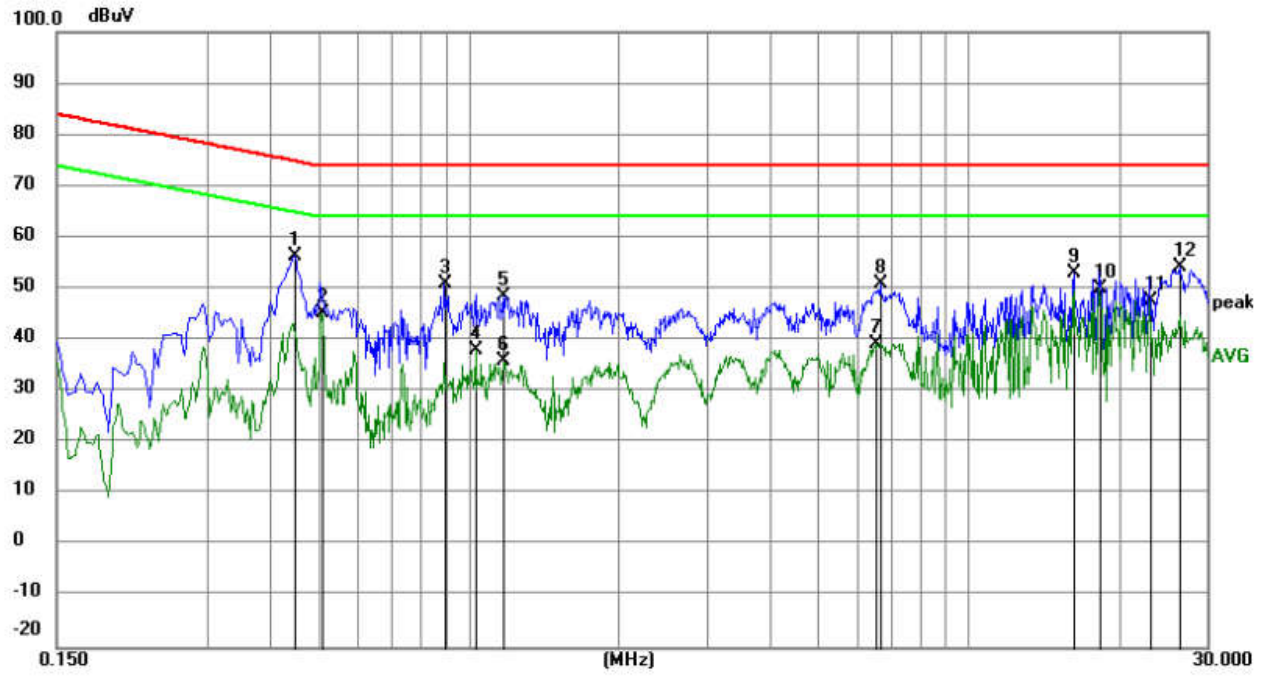
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.2895	27.22	9.58	36.80	50.54	-13.74	AVG	
2		0.3030	32.36	9.55	41.91	60.16	-18.25	QP	
3	*	0.4470	32.91	9.79	42.70	46.93	-4.23	AVG	
4		0.4515	39.88	9.78	49.66	56.85	-7.19	QP	
5		0.9825	24.56	9.75	34.31	46.00	-11.69	AVG	
6		1.0545	32.02	9.74	41.76	56.00	-14.24	QP	
7		1.7925	21.92	9.75	31.67	46.00	-14.33	AVG	
8		2.0760	32.13	9.75	41.88	56.00	-14.12	QP	
9		2.5260	29.20	9.77	38.97	56.00	-17.03	QP	
10		2.6700	21.52	9.77	31.29	46.00	-14.71	AVG	
11		3.0885	28.30	9.78	38.08	56.00	-17.92	QP	
12		3.0930	20.63	9.78	30.41	46.00	-15.59	AVG	

100Mb/s:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4515	46.16	9.46	55.62	74.85	-19.23	QP	
2		0.5100	35.06	9.48	44.54	64.00	-19.46	AVG	
3		1.1985	39.92	9.47	49.39	74.00	-24.61	QP	
4		1.2660	28.00	9.46	37.46	64.00	-26.54	AVG	
5		13.3575	51.16	9.53	60.69	74.00	-13.31	QP	
6		13.3575	47.78	9.53	57.31	64.00	-6.69	AVG	
7		16.2285	54.46	9.47	63.93	74.00	-10.07	QP	
8	*	16.2285	51.02	9.47	60.49	64.00	-3.51	AVG	
9		18.2445	54.43	9.41	63.84	74.00	-10.16	QP	
10		18.2445	50.77	9.41	60.18	64.00	-3.82	AVG	
11		23.1270	50.91	9.25	60.16	74.00	-13.84	QP	
12		23.1270	47.08	9.25	56.33	64.00	-7.67	AVG	

1000Mb/s:

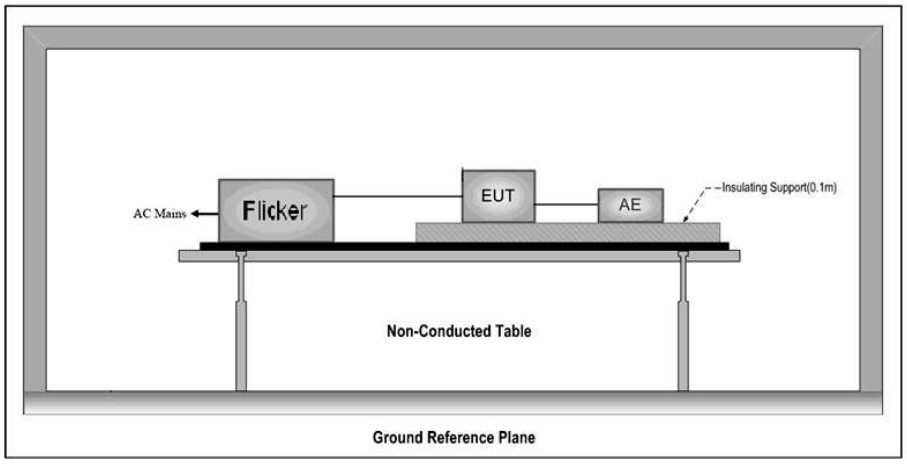


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.4470	47.03	9.46	56.49	74.93	-18.44	QP	
2		0.5100	35.64	9.48	45.12	64.00	-18.88	AVG	
3		0.8970	41.37	9.48	50.85	74.00	-23.15	QP	
4		1.0365	28.67	9.47	38.14	64.00	-25.86	AVG	
5		1.1760	39.16	9.47	48.63	74.00	-25.37	QP	
6		1.1760	26.61	9.47	36.08	64.00	-27.92	AVG	
7		6.5310	29.83	9.51	39.34	64.00	-24.66	AVG	
8		6.6660	41.35	9.51	50.86	74.00	-23.14	QP	
9		16.2285	43.67	9.47	53.14	74.00	-20.86	QP	
10	*	18.2445	40.66	9.41	50.07	64.00	-13.93	AVG	
11		23.1270	38.31	9.25	47.56	64.00	-16.44	AVG	
12		26.4885	45.16	9.13	54.29	74.00	-19.71	QP	

Note:
1. Margin=Measurement-Limit.
2. Measurement=Reading_Level+Correct Factor.
3. Correct Factor=Cable Factor+Lisn Factor.

7.1.3 Flicker Test Results

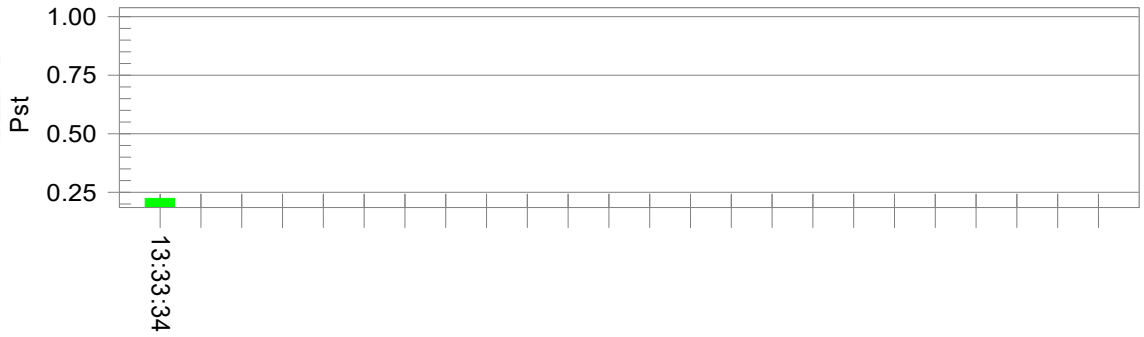
Test Requirement:	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.1, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.1, ETSI EN 301 489-52 V1.2.1 (2021-11) Clause 7.2.1
Test Method:	EN 301 489-1 V2.2.3 (2019-11) Clause 8.6
EUT Operation:	
Ambient:	Temp.: 22°C Humid.: 50% Press.:1010 mbar
Test Mode:	Mode a to Mode g
Test Status:	Pretest the EUT at different test mode and found the Mode a which is worst case, the test worst case mode is recorded in the report.
Equipment Used:	Refer to section 6 for details.
Test Setup:	



Test result:	PASS

Test Result: Pass **Status: Test Completed**

Pst_j and limit line **European Limits**



Parameter values recorded during the test:

Vrms at the end of test (Volt):	**228.95**			
Highest dt (%):		**Test limit (%):**		
T-max (mS):	**0**	**Test limit (mS):**	**500.0**	**Pass**
Highest dc (%):	**0.00**	**Test limit (%):**	**3.30**	**Pass**
Highest dmax (%):	**0.00**	**Test limit (%):**	**4.00**	**Pass**
Highest Pst (10 min. period):	**0.224**	**Test limit:**	**1.000**	**Pass**

7.2 EMS (Immunity)

Performance Criteria of EN 301 489-17, sub clause 6.2.1 table 2.

Table 2: Performance criteria

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 clause 6.2.2.		

Performance Criteria of EN 301 489-19, sub clause 6.2,clause 6.3,clause 6.4.

6.2 Performance criteria for Continuous phenomena applied to ROMES and ROGNSS receivers (CR)

For the EUT, excluding spot frequency tests as part of the immunity test with radiated RF electromagnetic fields (see ETSI EN 301 489-1 [1], clause 9.2):

- the general performance criteria set out in clause 6.1;
- during the test no false calls shall occur;
- at the conclusion of the test comprising the series of individual exposures the EUT shall operate as intended with no loss of functions or stored data (messages), as declared by the manufacturer.

For the spot frequency test as part of the immunity test with radiated RF electromagnetic fields (see ETSI EN 301 489-1 [1], clause 9.2) the EUT shall be assessed by monitoring the accuracy of the call received alert signal.

6.3 Performance criteria for Transient phenomena applied to ROMES and ROGNSS receivers (TR)

For the EUT:

- the general performance criteria set out in clause 6.1;
- during the test no false calls shall occur;
- at the conclusion of the test comprising the series of individual exposures, the EUT shall operate as intended with no loss of function and/or stored data (messages), as declared by the manufacturer.

6 Performance criteria

6.1 Performance criteria for Continuous phenomena

6.1.1 GSM and voice call

6.1.1.1 Performance criteria for Continuous phenomena applied to Transmitters (CT)

With a link established, during the test, the uplink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz.

In idle mode, the transmitter shall not operate unintentionally.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link shall have been maintained.

6.1.1.2 Performance criteria for Continuous phenomena applied to Receivers (CR)

During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence.

In the case of narrow band responses, the procedure in clause 4.4.1 shall be followed.

During the test, the downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz.

Performance Criteria of EN 301 489-52, sub clause 6

6 Performance criteria

6.1 Performance criteria for Continuous phenomena

6.1.1 GSM and voice call

6.1.1.1 Performance criteria for Continuous phenomena applied to Transmitters (CT)

With a link established, during the test, the uplink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz.

In idle mode, the transmitter shall not operate unintentionally.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link shall have been maintained.

6.1.1.2 Performance criteria for Continuous phenomena applied to Receivers (CR)

During the test, the RXQUAL of the downlink shall not exceed the value of three, measured during each individual exposure in the test sequence.

In the case of narrow band responses, the procedure in clause 4.4.1 shall be followed.

During the test, the downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check).

NOTE: When there is a high-level background noise present, the filter bandwidth may be reduced down to a minimum of 40 Hz.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link shall have been maintained.

6.1.2 UTRA

In the data transfer mode, the performance criteria can be one of the following:

- if the BER (as referred in clause 5.3.1 of ETSI TS 134 109 [4]) is used, it shall not exceed 0,001 during the test sequence;
- if the BLER (as referred in ETSI TS 134 109 [4]) is used, it shall not exceed 0,01 during the test sequence.

The BLER calculation shall be based on evaluating the CRC on each transport block. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.2.1 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

6.1.3 E-UTRA, E-UTRA with LAA, inband or guard band NB-IoT, Standalone NB-IoT

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.2.2 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

6.1.4 NR

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.3 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

6.2 Performance criteria for Transient phenomena

At the conclusion of each exposure of the transient phenomena, the EUT shall operate without loss of the communication link.

At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended without loss of user control functions or critical stored data.

In addition where the EUT supports idle mode it should be verified that the transmitter shall not unintentionally operate when transient phenomena are applied.

At the conclusion of the test, the EUT shall operate as intended with no loss of user control functions or critical stored data, and the communication link shall have been maintained.

6.1.2 UTRA

In the data transfer mode, the performance criteria can be one of the following:

- if the BER (as referred in clause 5.3.1 of ETSI TS 134 109 [4]) is used, it shall not exceed 0,001 during the test sequence;
- if the BLER (as referred in ETSI TS 134 109 [4]) is used, it shall not exceed 0,01 during the test sequence.

The BLER calculation shall be based on evaluating the CRC on each transport block. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.2.1 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

6.1.3 E-UTRA, E-UTRA with LAA, inband or guard band NB-IoT, Standalone NB-IoT

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.2.2 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

6.1.4 NR

In data transfer mode, the data throughput of the EUT shall not fall below 95 % of the maximum data throughput. Details are specified in annex C.

In the case of narrow band responses, the procedure in clause 4.4.3 shall be followed.

When testing a voice call, the performance criteria in clause 6.1.1 shall apply.

6.2 Performance criteria for Transient phenomena

At the conclusion of each exposure of the transient phenomena, the EUT shall operate without loss of the communication link.

At the conclusion of the total test comprising the series of individual exposures, the EUT shall operate as intended without loss of user control functions or critical stored data.

In addition where the EUT supports idle mode it should be verified that the transmitter shall not unintentionally operate when transient phenomena are applied.

7.2.1 Radiated Immunity

Test Requirement: ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2,
ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2,
EN 301 489-52 V1.2.1(2021-11) Clause 7.3.1

Test Method: EN 301 489-1 V2.2.3 (2019-11) Clause 9.2

EUT Operation:

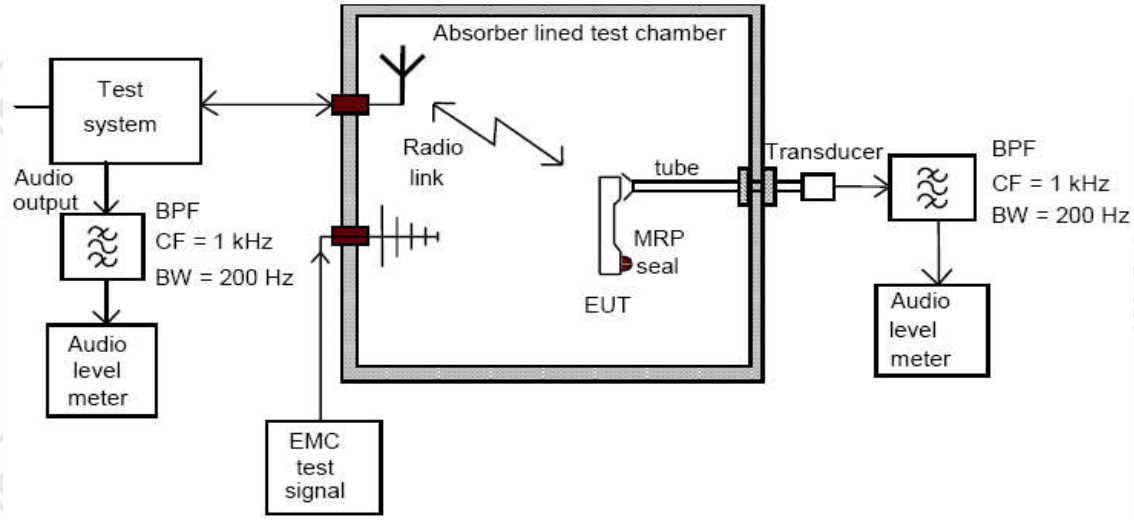
Ambient: Temp.: 22°C Humid.:52% Press.: 1010 mbar

Test Mode: Mode a to Mode g

Criterion Required: A

Equipment Used: Refer to section 6 for details.

Test Setup:



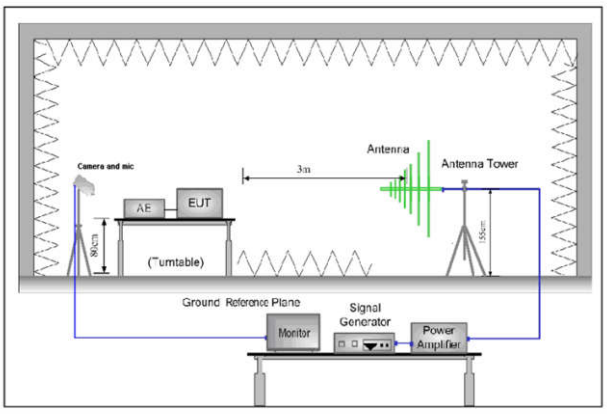


Figure 1. 80MHz to 1GHz

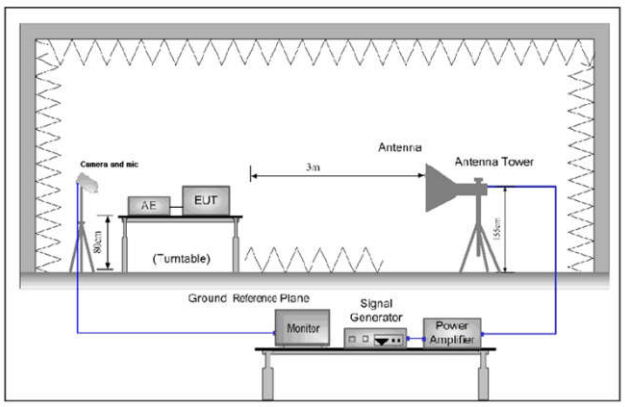


Figure 2. 1GHz to 6GHz

Test Procedure:

1) For table-top equipment, the EUT was placed in the chamber on a non-conductive table 0.8m high. For arrangement of floor-standing equipment, the EUT was mounted on a non-conductive support 0.1m above the supporting plane. For human body-mounted equipment, the EUT may be tested in the same manner as table top items.
2) If possible, a minimum of 1 m of cable is exposed to the electromagnetic field. Excess length of cables interconnecting units of the EUT shall be bundled low-inductively in the approximate center of the cable to form a bundle 30 cm to 40 cm in length.
3) The EUT was initially placed with one face coincident with the calibration plane. The EUT face being illuminated was contained within the UFA (Uniform Field Area).
4) The frequency ranges to be considered were swept with the signal modulated and pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. Where the frequency range was swept incrementally, the step

size was not exceed 1% of the preceding frequency value.

5) The dwell time of the amplitude modulated carrier at each frequency was not be less than the time necessary for the EUT to be exercised and to respond, and was not less than 0.5 s.
6) The test normally was performed with the generating antenna facing each side of the EUT.
7) The polarization of the field generated by each antenna necessitates testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.
8) The EUT was performed in a configuration to actual installation conditions, a video camera and/or an audio monitor were used to monitor the performance of the EUT.

Test result: PASS

Test Data

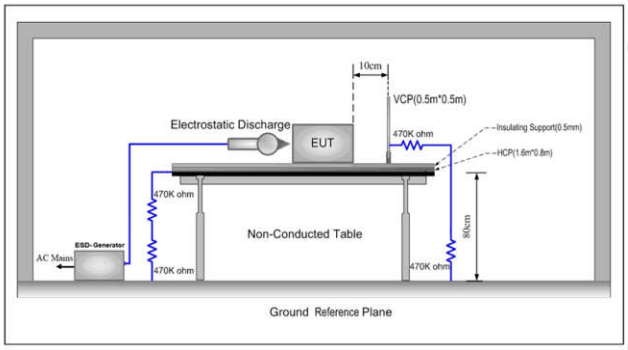
Frequency	Level	Modulation	EUT Face	Antenna Polaxis	Result / Observations
80MHz-1GHz, 1GHz to 6GHz	3V/m	1kHz, 80% Amp. Mod, 1% increment Dwell time: 1 seconds	Front	V	A
				H	A
			Back	V	A
				H	A
			Left	V	A
				H	A
			Right	V	A
				H	A

Remark:

A: No performance degradation during test.

7.2.2 ESD

Test Requirement:	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1(2021-11) Clause 7.3.1
Test Method:	EN 301 489-1 V2.2.3 (2019-11) Clause 9.3
EUT Operation:	
Ambient:	Temp.: 20°C Humid.: 52% Press.: 1010 mbar
Test Mode:	Mode a to Mode g
Criterion Required:	B
Discharge Impedance:	330 Ω / 150 pF
Polarity:	Positive & Negative
Number of Discharge:	Minimum 10 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum
Equipment Used:	Refer to section 6 for details.
Test Setup:	



Test set-up for tabletop equipment

Test Procedure:

1) Contact discharges to the conductive surfaces and to coupling planes:
The EUT was exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points (a minimum of 50 discharges at each point). One of the test points was subjected to at least 50 indirect discharges (contact) to the centre of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points were available, then at least 200 indirect discharges were applied in the indirect mode. Tests were performed at a maximum repetition rate of one discharge per second.

Air discharge at slots and apertures, and insulating surfaces:
On those parts of the EUT where it was not possible to perform contact discharge testing, the equipment was investigated to identify user accessible points where breakdown may occur. This investigation was restricted to those areas normally handled by the user. A minimum of 10 single air discharges were applied to the selected test point for each such area.
The application of electrostatic discharges to the contacts of open connectors was not required by this standard.

2) The EUT was put on a 0.8m high wooden table for table-top equipment or 0.1m high for floor standing equipment standing on the ground reference plane(GRP).

3) A horizontal coupling plane(HCP) 1.6m by 0.8m in size was placed on the table, and the EUT with its cables were isolated from the HCP by an insulating support thick than 0.5mm. The VCP 0.5m by 0.5m in size & HCP were constructed from the same material type & thinkmess as that of the GRP, and connected to the GRP via a 470kΩ resistor at each end. The distance between EUT and any of the other metallic surface excepted the GRP, HCP and VCP was greater than 1m.

4) During the contact discharges, the tip of the discharge electrode was touch the EUT before the discharge switch is operated. During the air discharges, the round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT.
5) After each discharge, the ESD generator was removed from the EUT, the generator was then retriggered for a new single discharge. For ungrounded product, a discharge cable with two resistances was used after each discharge to remove remnant electrostatic voltage. 10 times of each polarity single discharge were applied to HCP and VCP.

Test Results: PASS

Observations:	Test Point: 1. All insulated enclosure and seams. 2. All accessible metal parts of the enclosure.			
Direct Application Test Results				
Direct Application			Test Results	
Discharge Level (kV)	Pulse No.	Test Point	Contact Discharge	Air Discharge
± 8	10 for every level	1	N/A	A
± 4	10 for every level	2	B	N/A
Indirect Application for tabletop equipment Test Results				
Indirect Application			Test Results	
Discharge Level (kV)	Pulse No.		Horizontal Coupling	Vertical Coupling
± 4	10 for every level		A	A

Remark:

A: No performance degradation during test.

N/A: Not applicable.

7.2.3 RF Common Mode 0.15MHz to 80MHz

Test Requirement:	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1(2021-11) Clause 7.3.1
Test Method:	EN 301 489-1 V2.2.3 (2019-11) Clause 9.5
Test Level:	3V rms
Modulation:	80%, 1kHz Amplitude Modulation
Test Port :	AC port.
Criterion Required:	A
EUT Operation:	
Ambient:	Temp.: 23°C Humid.: 51% Press.: 1010 mbar
Test Mode:	Mode a to Mode g
Equipment Used:	Refer to section 6 for details.
Test Setup:	

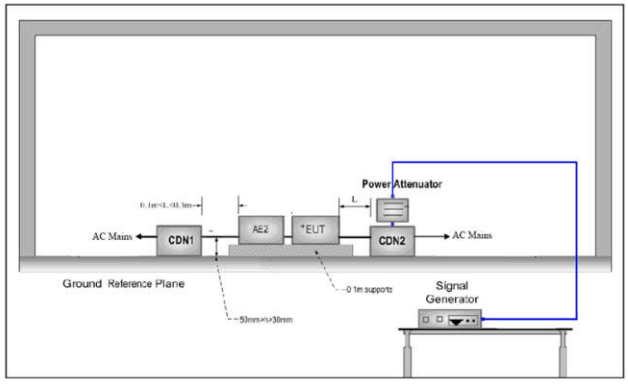


Figure 1. For AC port

Test Procedure:

1) The EUT was placed on an insulating support of 0.1m height above a ground reference Plane, arranged and connected to satisfy its functional requirement. All cables exiting the EUT was supported at a height of at least 30 mm above the ground reference plane.
2) The coupling and decoupling devices were required, they were located between 0.1 m and 0.3 m from the EUT. This distance was to be measured horizontally from the projection of the EUT on to the ground reference plane to the coupling and decoupling device.
3) Each AE, used with clamp injection, shall be placed on an insulating support 0.1 m above the ground reference plane. A decoupling network shall be installed on each cable between the EUT and AE except the cable under test. All cables connected to each AE, other than those being connected to the EUT, shall be provided with decoupling networks. The decoupling networks connected to each AE (except those on cables between the EUT and AE) shall be applied no further than 0.3 m from the AE. The cable(s) between the AE and the decoupling network (s) or in between the AE and the injection clamp shall not be bundled nor wrapped and shall be kept between 30 mm and 50 mm above the ground reference plane
4) The frequency range was swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80 % amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to change coupling devices as necessary. Where the frequency was swept incrementally, the step size does not exceed 1 % of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency was not less than the time necessary for the EUT to be exercised and to respond, and was not less than 0.5 s.

Test result: PASS

Test data:

Frequency	Line	Test Level	Modulation	Step Size	Dwell Time	Observation (Performance Criterion)
150kHz to 80MHz	AC port (2 Line)	3Vrms	80%, 1kHz Amp. Mod.	1%	1 S	A
150kHz to 80MHz	LAN port	3Vrms	80%, 1kHz Amp. Mod.	1%	1 S	A

Remark:

A: No performance degradation during test.

7.2.4 Electrical Fast Transients (EFT)

Test Requirement:	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1(2021-11) Clause 7.3.1
Test Method:	EN 301 489-1 V2.2.3 (2019-11) Clause 9.4
Test Level:	± 0.5kV, ± 1.0kV on AC port.
Polarity:	Positive & Negative
Repetition Frequency:	5kHz
Burst Period:	300ms
Test Duration:	2 minute per level & polarity
EUT Operation:	
Ambient:	Temp.: 20°C Humid.: 52% Press.: 1010mbar
Test Mode:	Mode a to Mode g
Equipment Used:	Refer to section 6 for details.
Test Setup:	

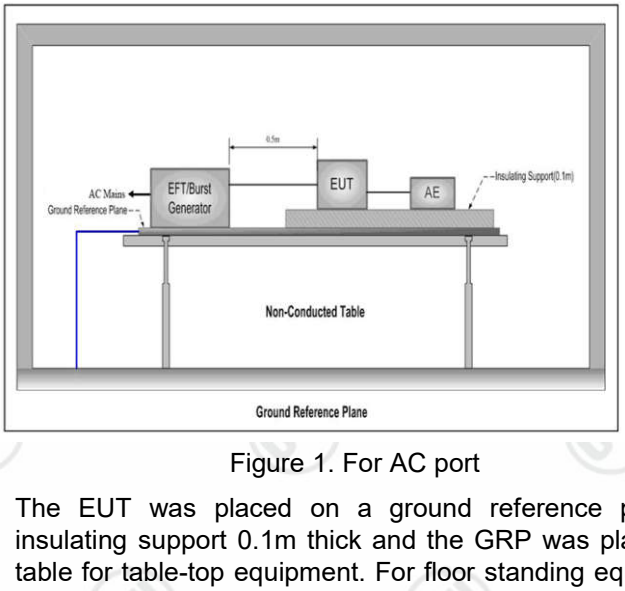


Figure 1. For AC port

Test Procedure:

1) The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0.1m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2) The GRP shall project beyond the EUT and the clamp by at least 0.1m on all sides. The distance between the EUT and any other of the metallic surface except the GRP was greater than 0.5m. All cables to the EUT was placed on the insulation support 0.1m above GRP. A cable not subject to EFT was routed as far as possible from cable under test to minimize the coupling between the cables.
3) The length of signal and power cable between the EUT and EFT generator was 0.5m. If the cable is a non-detachable supply cable more than 0.5m, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0.1m above the GRP.
4) The EUT was conducted the below specified test voltages for line and neutral or line, neutral and earth simultaneously (for telecommunication, single, control and DC port line with capacitive coupling clamp), 120 seconds duration. If the equipment contains identical ports, only one was tested; multicomputer cables, such as a 50-pair telecommunication cable, were tested as a single cable. Cables did not be split or divided into groups of conductors for this test; interface ports, which were intended by the manufacturer to be connected to data cables not longer than 3 m, did not be tested.

Test result: PASS

Test data:

Lead under Test	Level (kV)	Coupling Direct/Clamp	EUT operating mode	Observations (Performance Criterion)
Live	± 0.5,1.0	Direct	Mode a to Mode g	A
Neutral	± 0.5,1.0	Direct		A
Live, Neutral	± 0.5,1.0	Direct		A
LAN port	± 0.5	Clamp		A

Remark:

A: No performance degradation during test.

7.2.5 Surge

Test Requirement:	ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2, ETSI EN 301 489-19 V2.1.1 (2022-09) Clause 7.2, EN 301 489-52 V1.2.1(2021-11) Clause 7.3.1
Test Method:	EN 301 489-1 V2.2.3 (2019-11) Clause 9.8
Test Level:	For AC port ± 1kV Live to Neutral
Criterion Required:	B
Polarity:	Positive & Negative
Interval:	60s between each surge
No. of Surges:	5 positive, 5 negative at 0°, 90°, 180°, 270°.
EUT Operation:	
Ambient:	Temp.: 24°C Humid.: 55% Press.: 1010mbar
Test Mode:	Mode a to Mode g
Equipment Used:	Refer to section 6 for details.
Test Setup:	

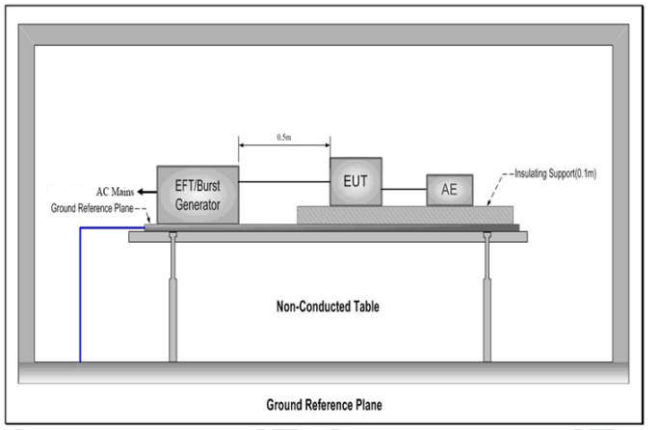


Figure 1. For AC port

Test Procedure:

1) The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0.1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2) The 1.2/50 μs surge was to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks were 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 so that the specified wave may be applied on the lines under test.
3) The power cord between the EUT and the coupling/decoupling network was not exceed 2 m in length. The interconnection line between the EUT and the coupling/ decoupling network shall not exceed 2 m in length.
4) The EUT was conducted 0.5 kV and 1 kV test voltage for line to line and line to neutral and conducted 0.5 kV, 1 kV and 2 kV test voltage for line to earth and neutral to earth, five positive pulses and five negative pulses each at 0°, 90°, 180° and 270° for a.c. power ports and five positive pulses and five negative surge pulses for d.c. power ports (for telecommunication port, It was 0.5 kV for indoor cable longer than 10m line to ground and 0.5kV,1kV test voltage for outdoor cable line to ground, five positive pulses and five negative surge pulses), The test levels were applied on the EUT with a 2 Ω generator source impedance for power supply terminals and 40Ω output impedance for interconnection lines. The tests were done at repetition rate one per minute.

Test result: PASS

Test data:

For AC port (2 line)					
Pulse No	**Line-Line**	**Level (kV)**	**Surge interval**	**phase (deg)**	**Observation (Performance Criterion)**
1–5	L-N	+1	60s	0°	A
6–10	L-N	-1	60s	0°	A
11–15	L-N	+1	60s	90°	A
16–20	L-N	-1	60s	90°	A
21–25	L-N	+1	60s	180°	A
26–30	L-N	-1	60s	180°	A
31–35	L-N	+1	60s	270°	A
36–40	L-N	-1	60s	270°	A

Remark:

A: No performance degradation during test.

7.2.6 Voltage Dips and Interruptions

Test Requirement: ETSI EN 301 489-17 V3.2.4 (2020-09) Clause 7.2,
ETSI N 301 489-19 V2.1.1 (2022-09) Clause 7.2,
EN 301 489-52 V1.2.1(2021-11) Clause 7.3.1

Test Method: EN 301 489-1 V2.2.3 (2019-11) Clause 9.7

Test Level: Voltage dip: 0 % residual voltage for 0.5 cycle;
Voltage dip: 0 % residual voltage for 1 cycle;
Voltage dip: 70 % residual voltage for 25 cycles(at 50 Hz);
Voltage interruption: 0 % residual voltage for 250 cycles(at 50 Hz).

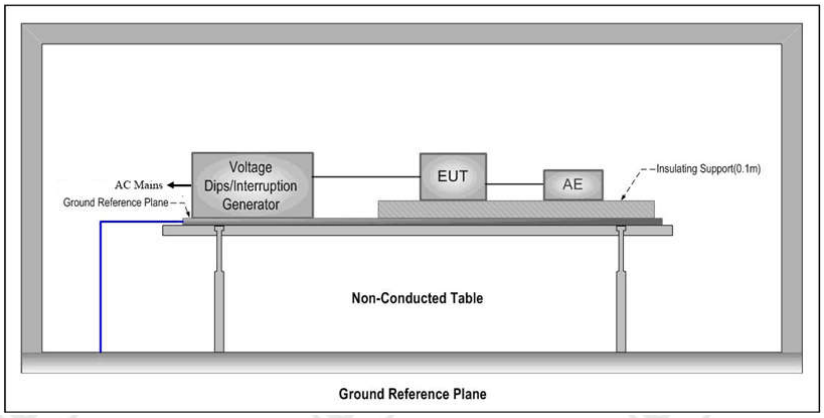
No. of Dips / Interruptions: 3 per Level

EUT Operation:

Ambient: Temp.: 22°C Humid.: 50% Press.:1010mbar

Test Mode: Mode a to Mode g

Test Setup:



Test Procedure:

1) The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0.1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2) The test was performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer.
3) The EUT was tested for each selected combination of test level and duration with a sequence of three dips /interruptions with intervals of 10 s minimum. Each representative mode of operation was tested.
4) For EUT with more than one power cord, each power cord was tested individually.

Equipment Used: Refer to section 6 for details.

Test result: PASS

Test Results:

EUT operating mode	% U_T	Phase	Duration of dropout in Periods(ms)	No. of dropout	Time between dropout	Observations (Performance Criterion)
Above modes	0	0° &180°	10	3	10s	A
Above modes	0	0° &180°	20	3	10s	A
Above modes	70	0° &180°	500	3	10s	A
Above modes	0	0° &180°	5000	3	10s	C

Remark:

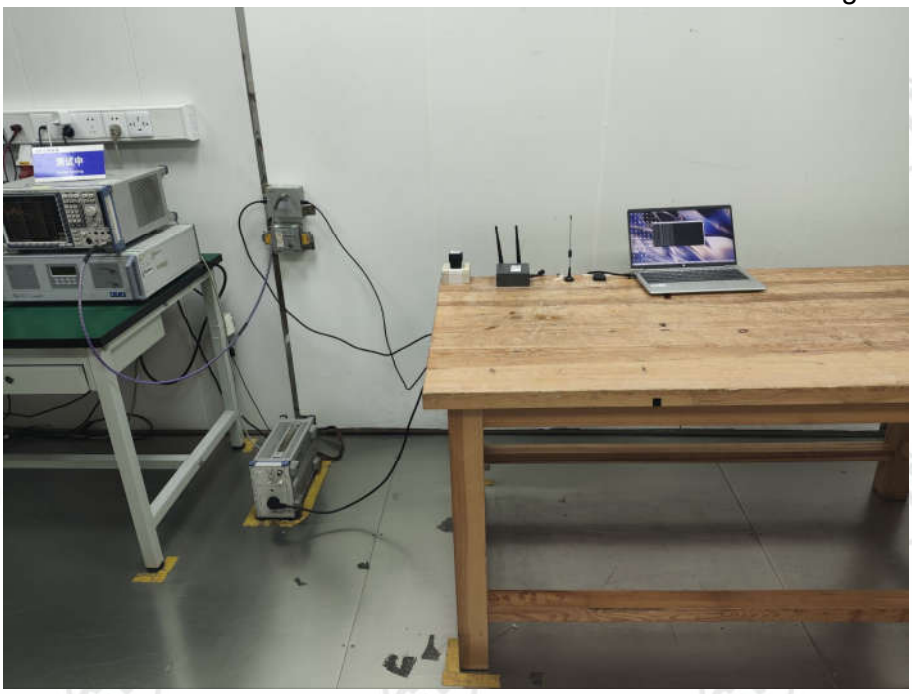
A: No performance degradation during test.

C: SThe product stop working during the test and it can recover by manual after test.

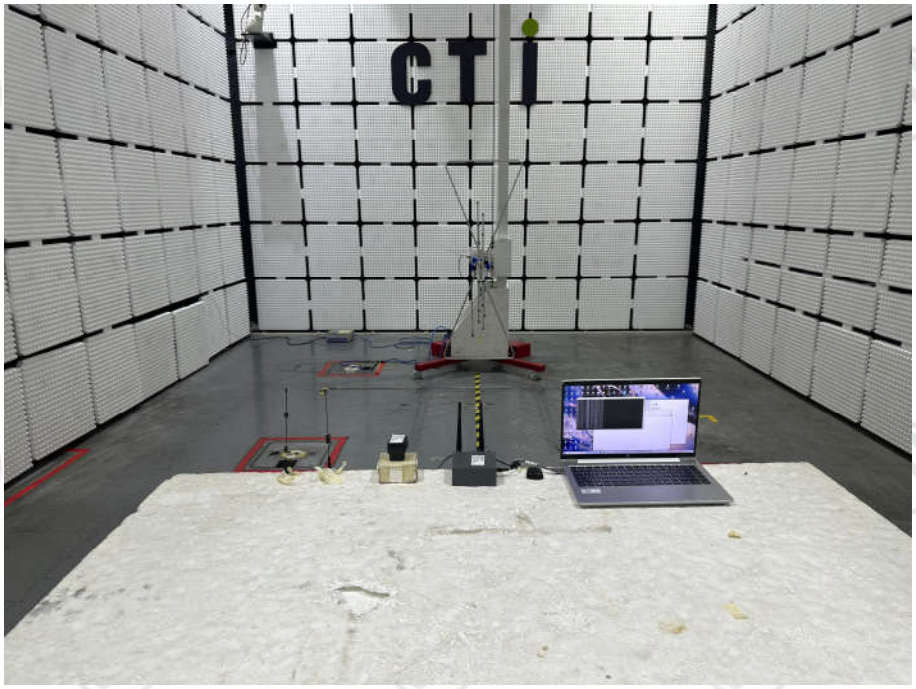
APPENDIX PHOTOGRAPHS OF TEST SETUP

CONDUCTED DISTURBANCE TEST SETUP-1

CONDUCTED DISTURBANCE TEST SETUP-2

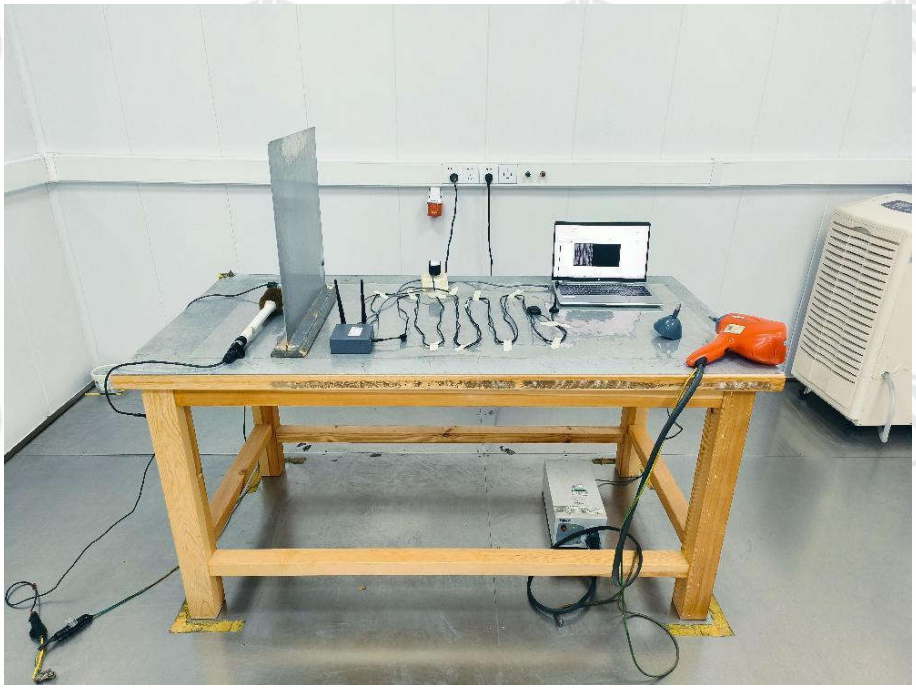


CONDUCTED DISTURBANCE TEST SETUP-3



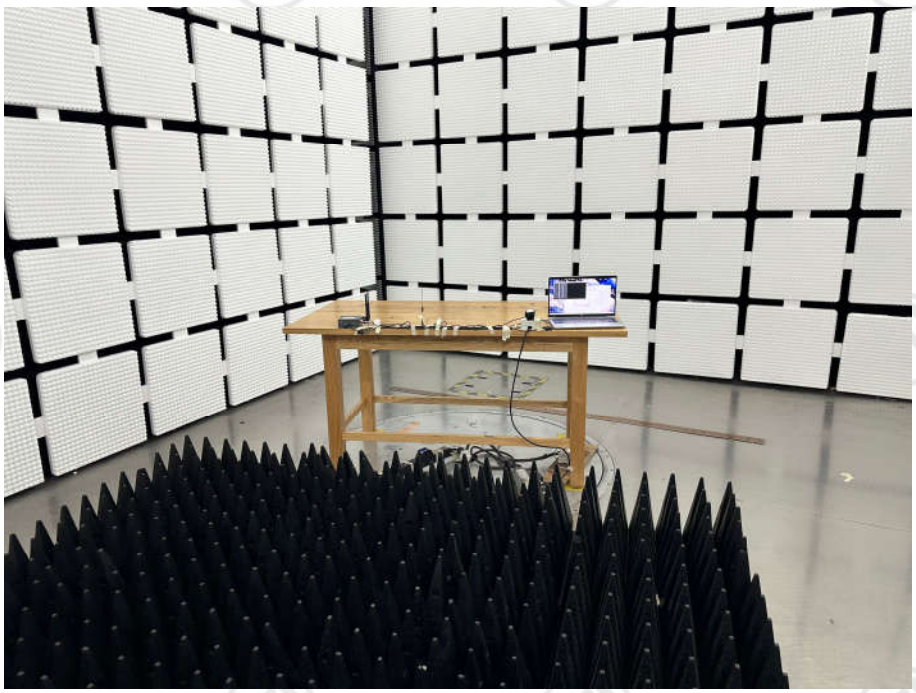
RADIATED DISTURBANCE TEST SETUP-1

RADIATED DISTURBANCE TEST SETUP-2

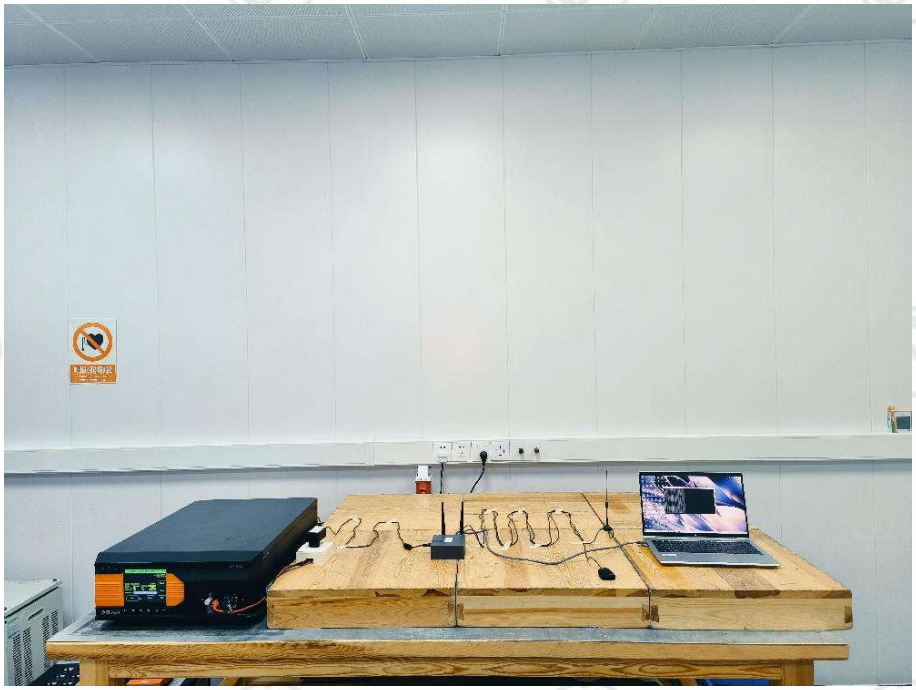


ESD TEST SETUP

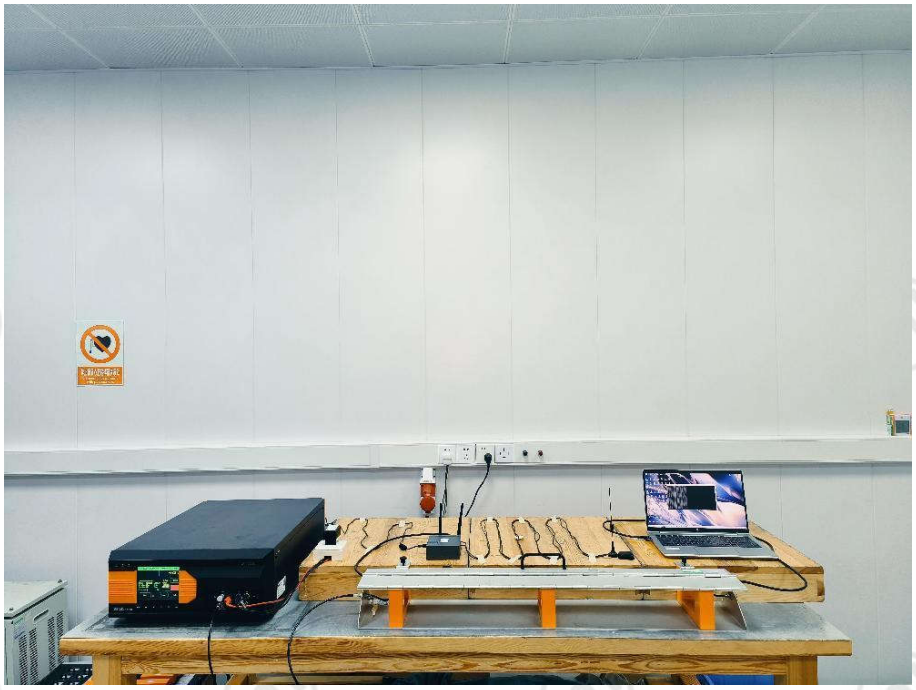
Flicker Test Setup



RADIO-FREQUENCY ELECTROMAGNETIC FIELD IMMUNITY TEST SETUP

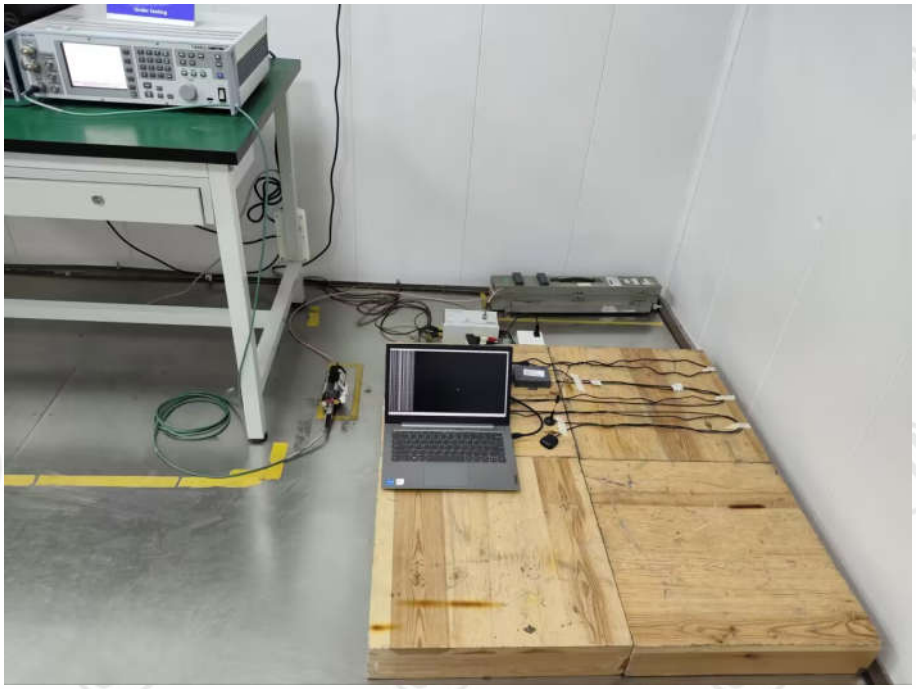


EFT TEST SETUP-1



EFT TEST SETUP-2

SURGES TEST SETUP-1



RADIO-FREQUENCY CONTINUOUS CONDUCTED IMMUNITY TEST SETUP-1

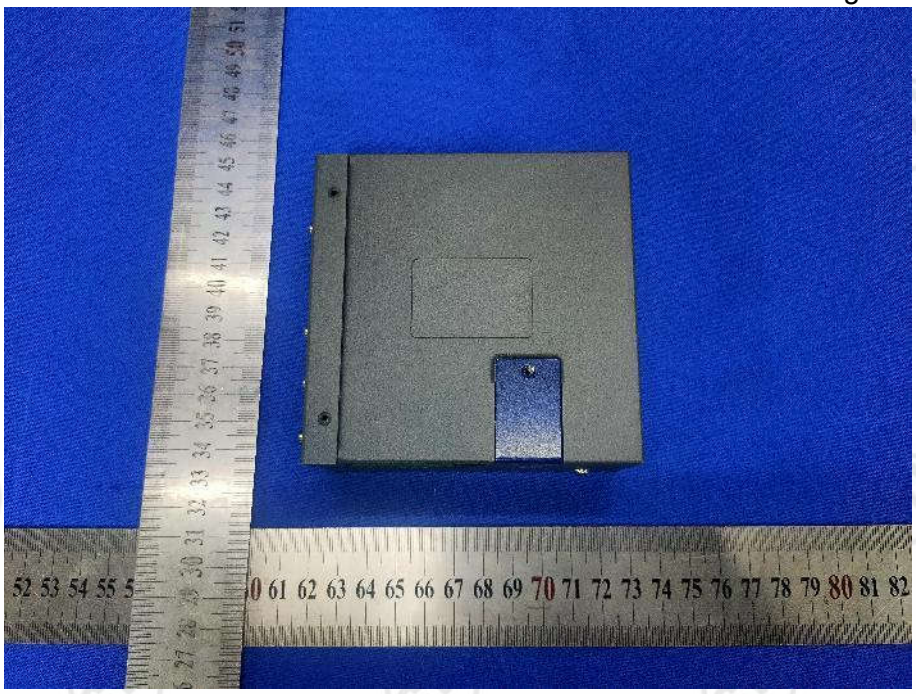
RADIO-FREQUENCY CONTINUOUS CONDUCTED IMMUNITY TEST SETUP-2

VOLTAGE DIPS AND INTERRUPTIONS TEST SETUP

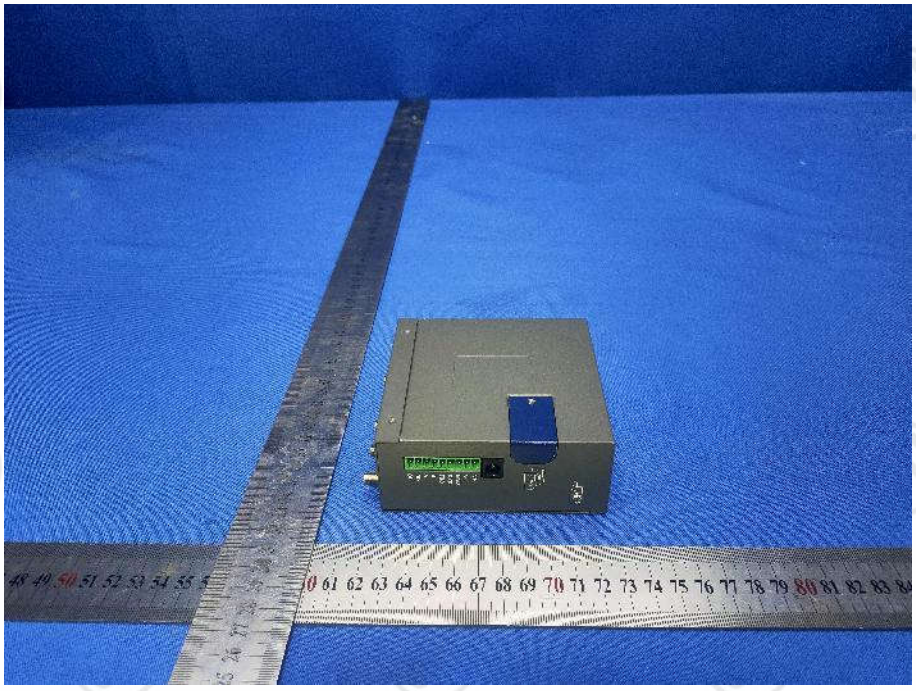
APPENDIX PHOTOGRAPHS OF EUT

View of Product-1

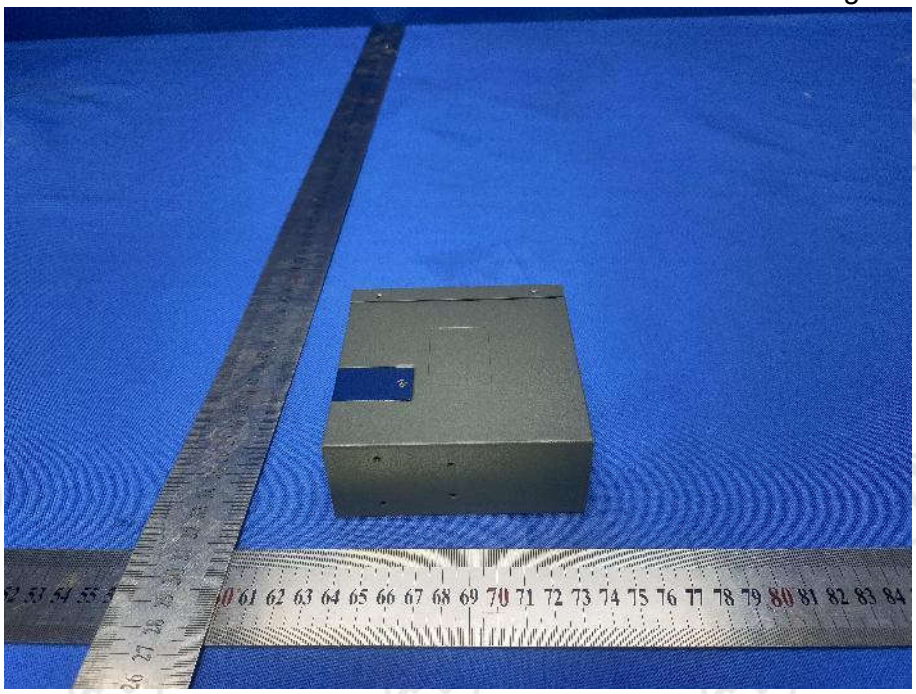
View of Product-2



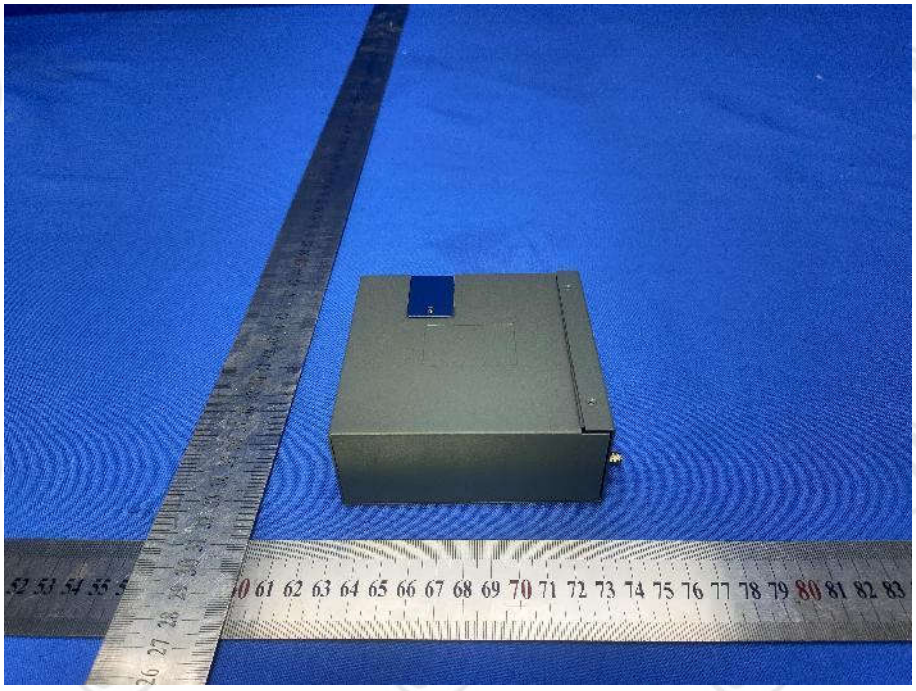
View of Product-3



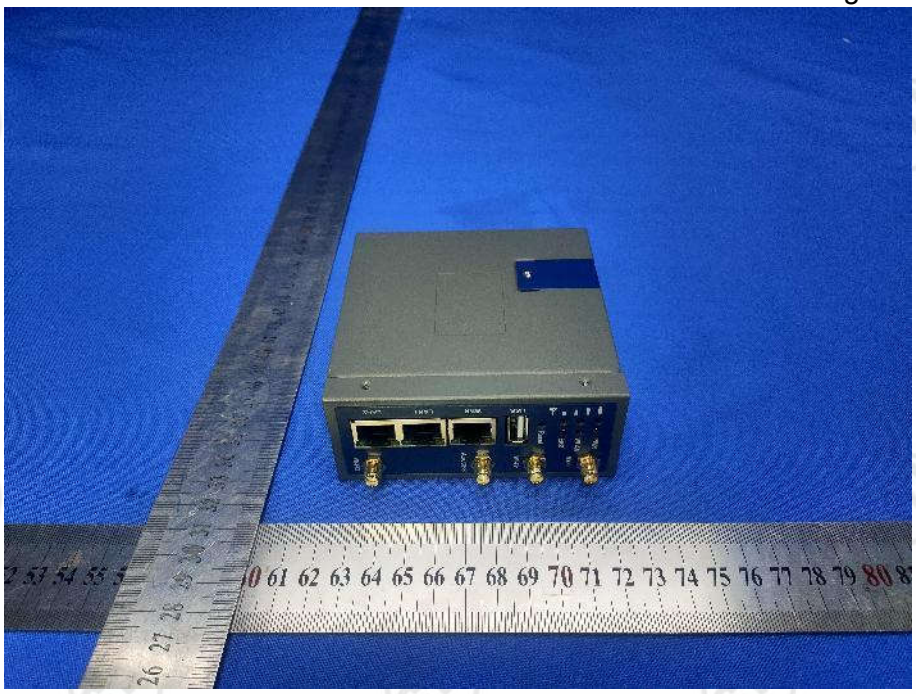
View of Product-4



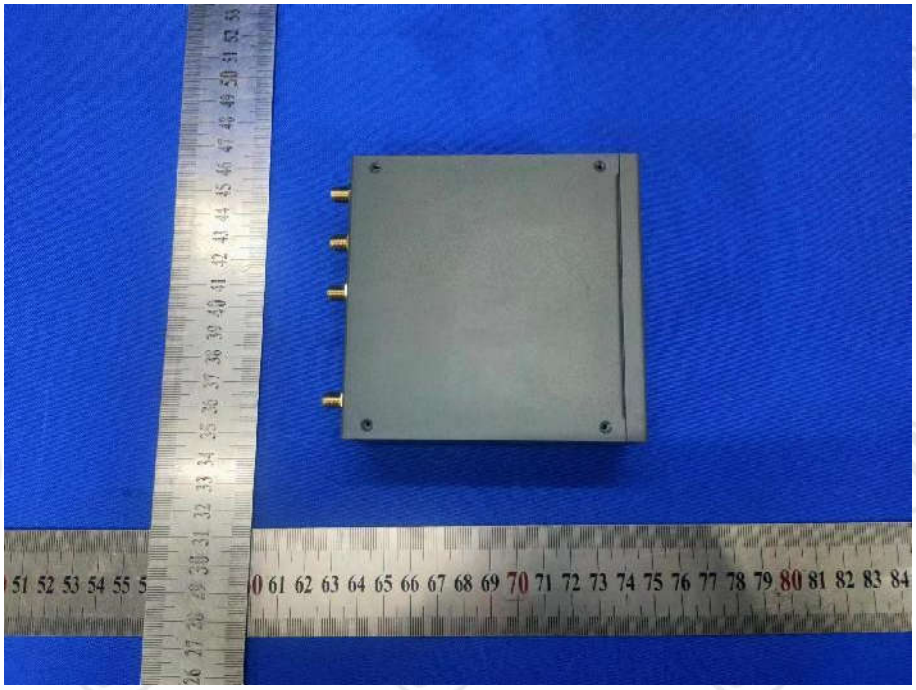
View of Product-5



View of Product-6



View of Product-7



View of Product-8

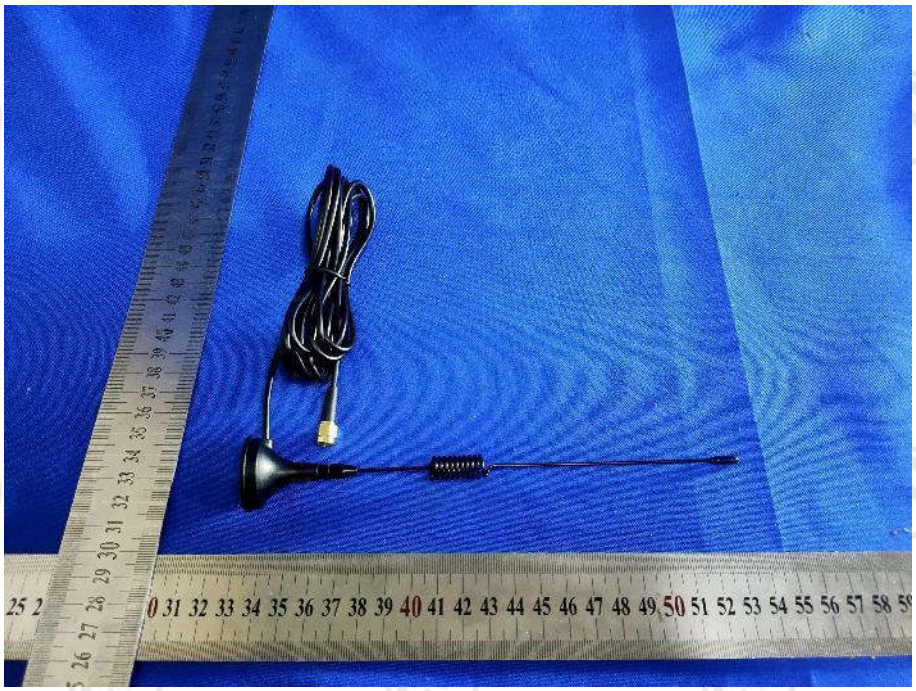
View of Product-9

View of Product-10

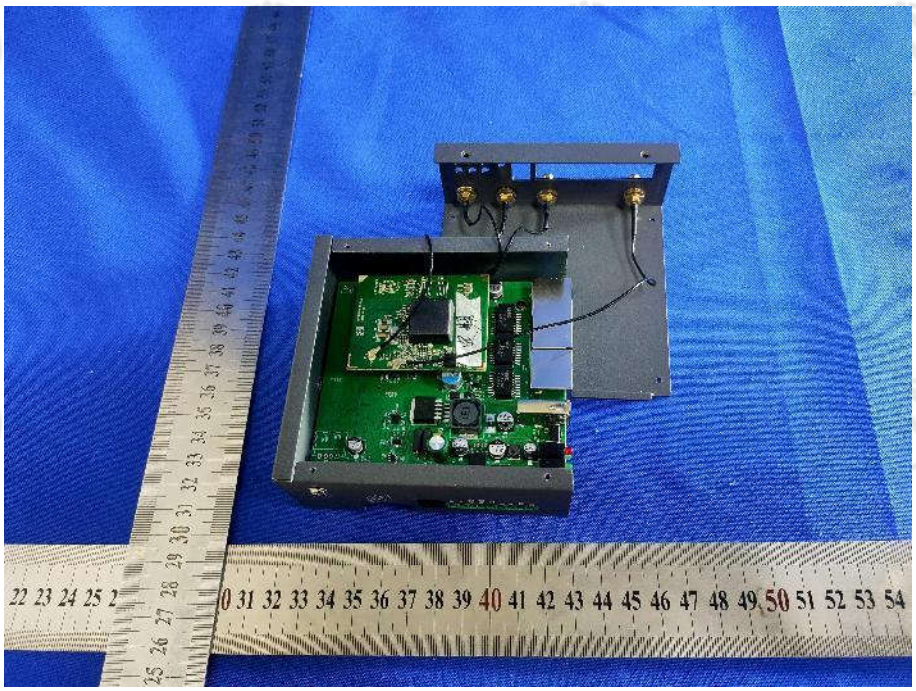
View of Product-11

View of Product-12

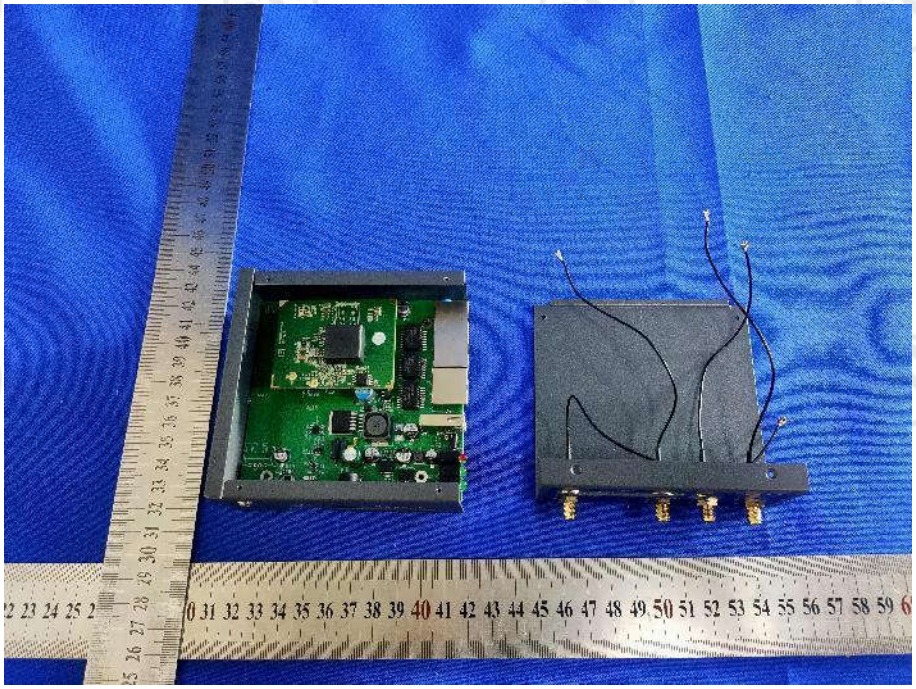
View of Product-13



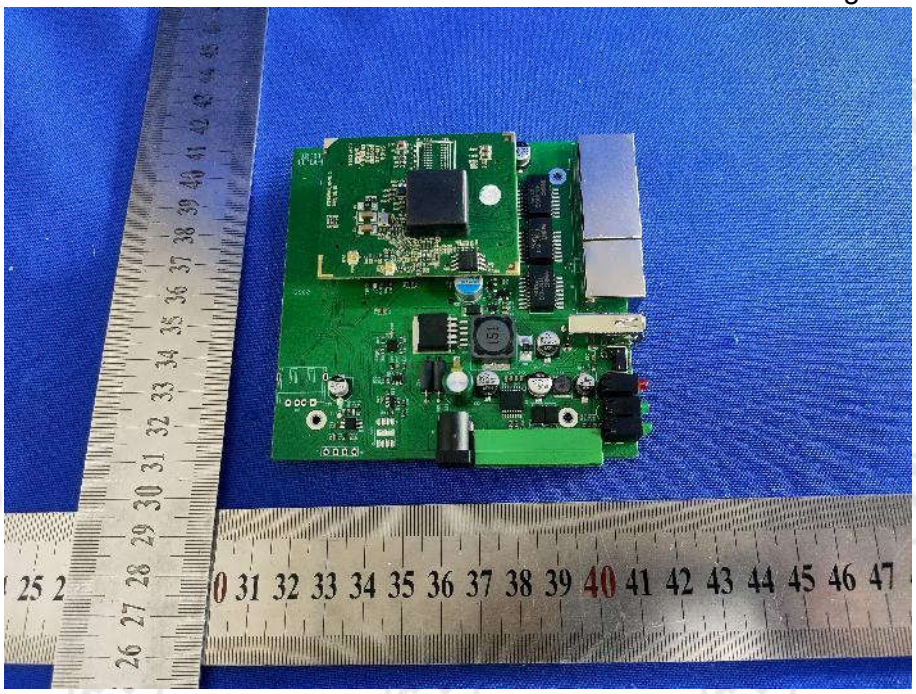
View of Product-14



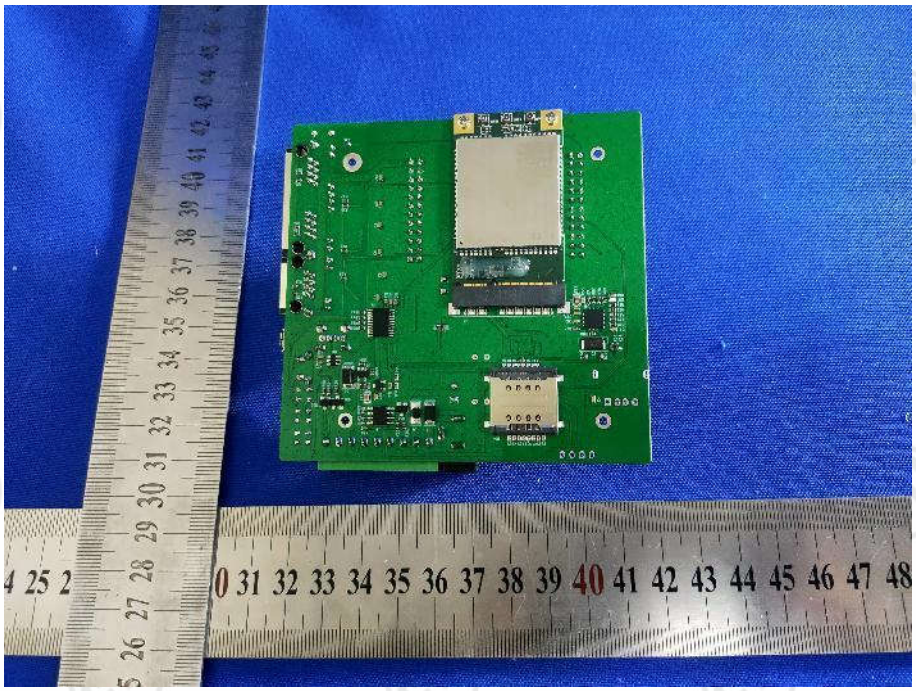
View of Product-15



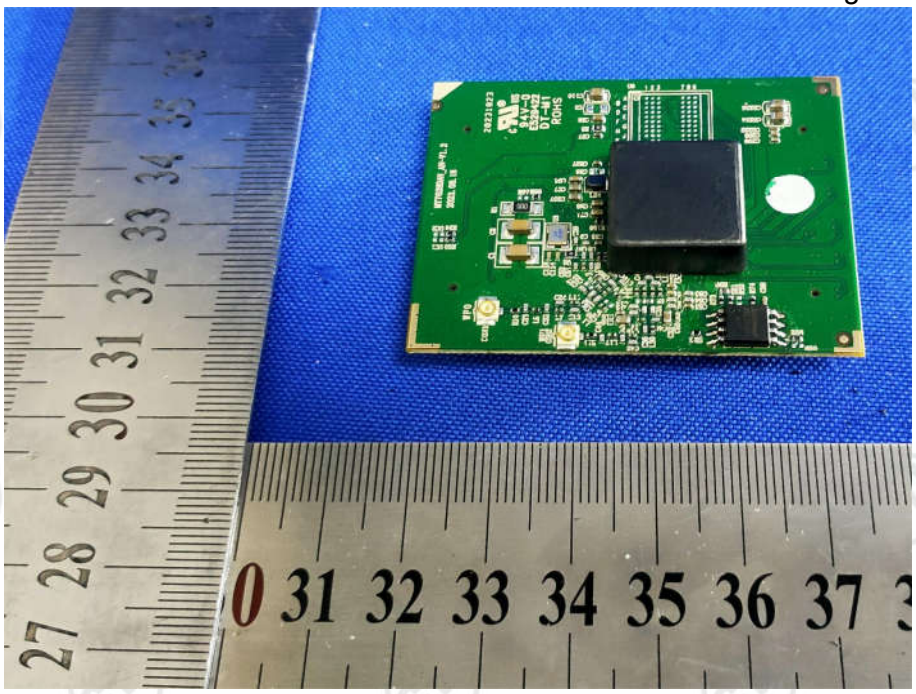
View of Product-16



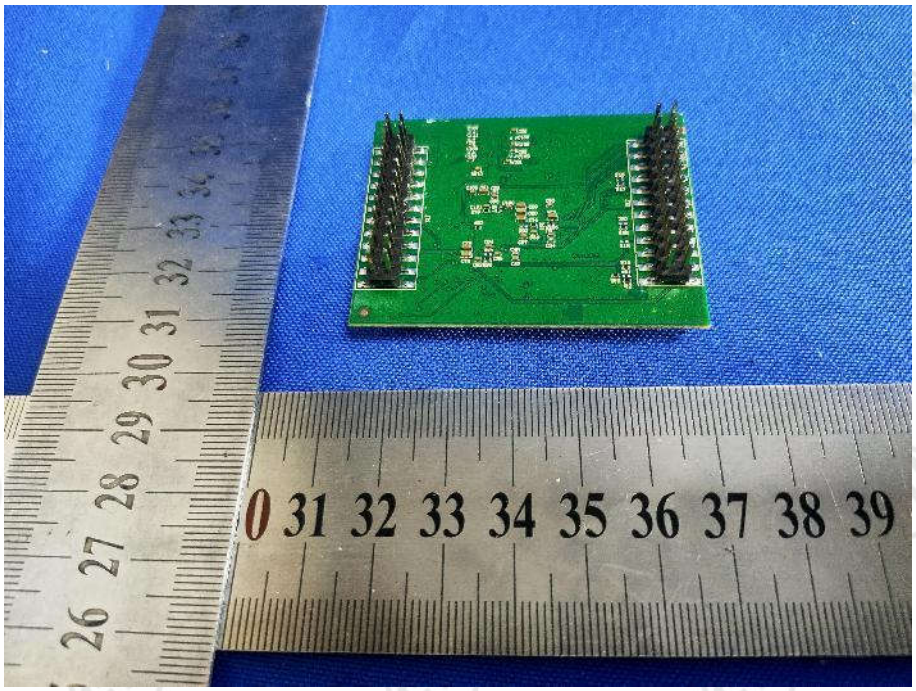
View of Product-17



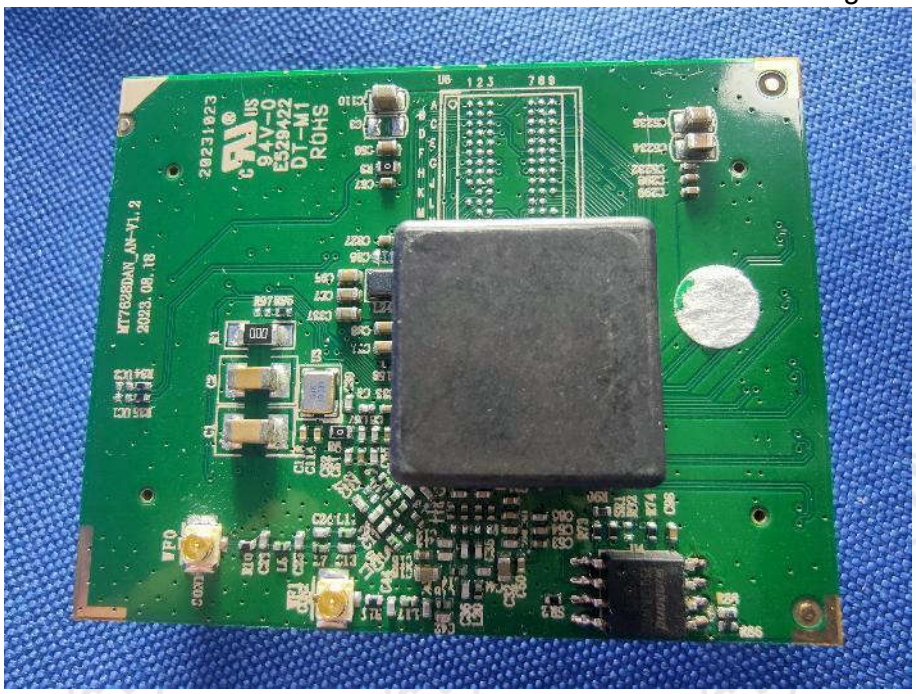
View of Product-18



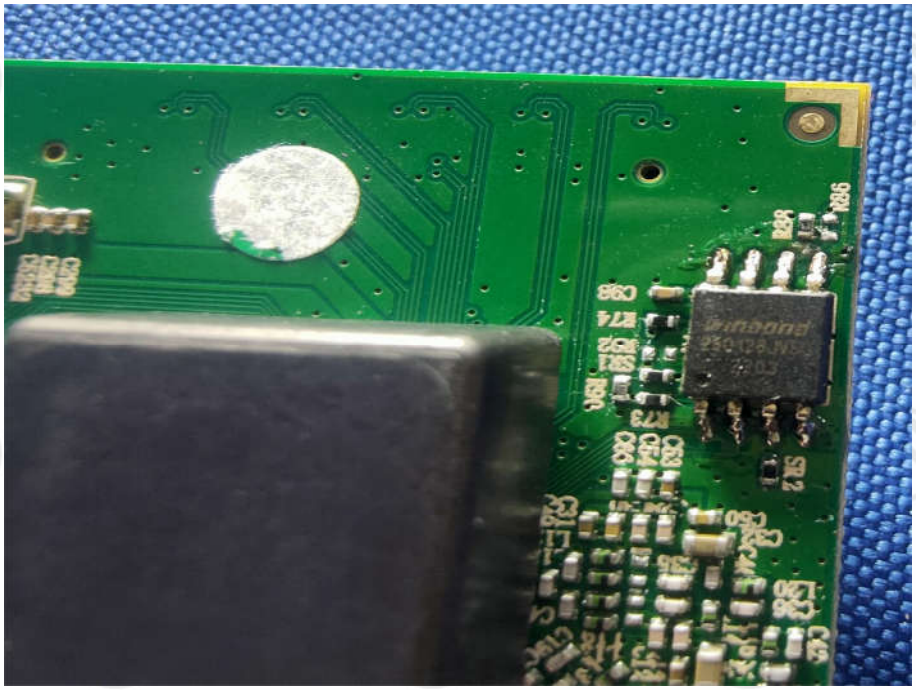
View of Product-19



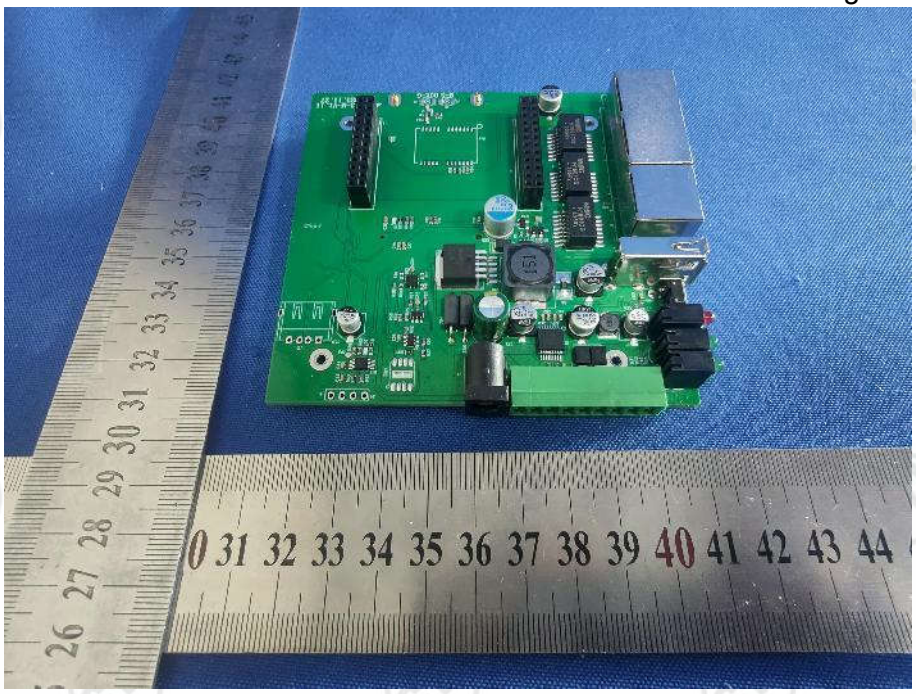
View of Product-20



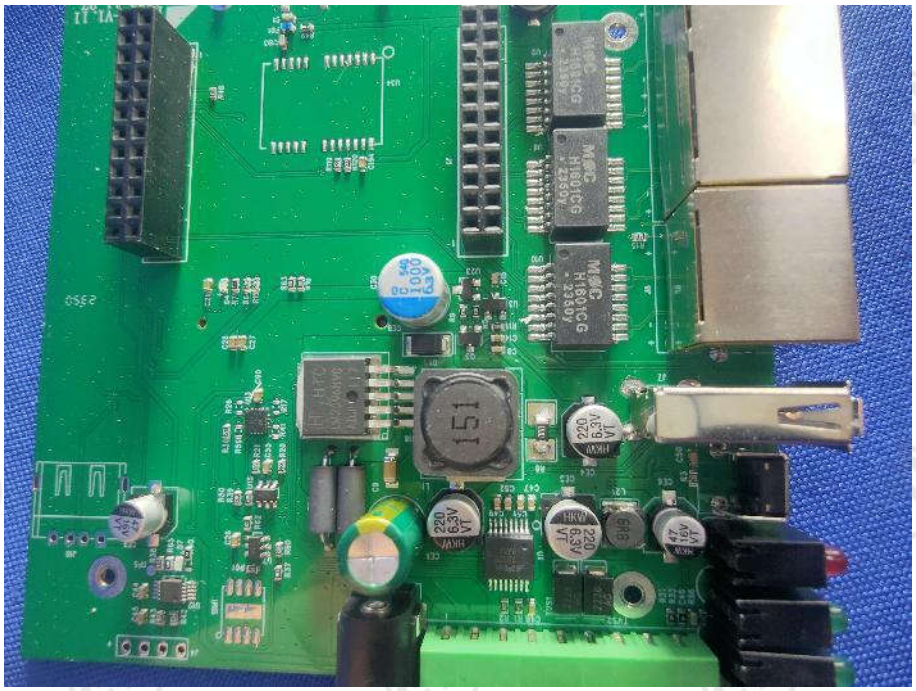
View of Product-21



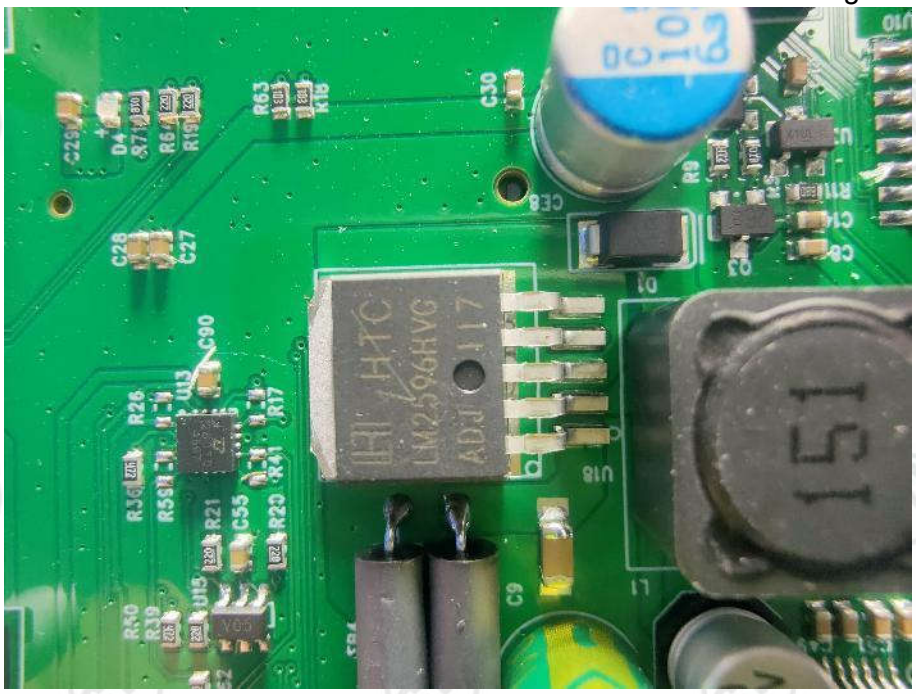
View of Product-22



View of Product-23

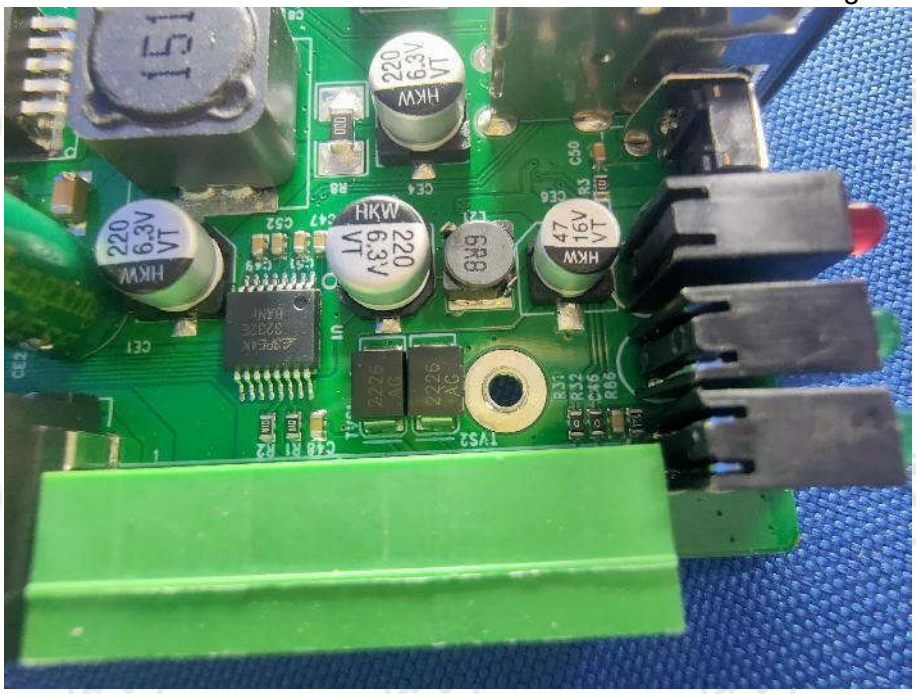


View of Product-24

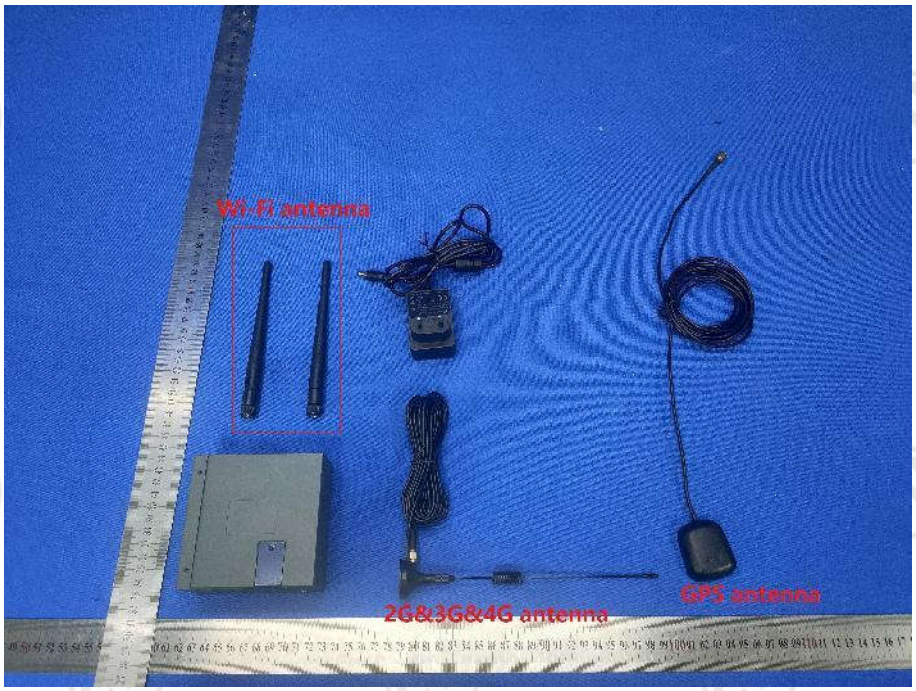


View of Product-25

View of Product-26



View of Product-27



View of Product-28

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of CTI, this report can't be reproduced except in full.

*** End of Report ***