

TEST REPORT

Product	: BE5100 Dual-Band Wi-Fi 7 Router(2.5GE)
Trade mark	: Tenda
Model/Type reference	: RE6L Pro, TE6L Pro
Serial Number	: N/A
Report Number	: EED32Q817402
Date of Issue	: Dec. 09, 2024
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 V3.3.1 (2024-09)
Test result	: PASS

Prepared for:

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6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road,
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Date of Issue:

Dec. 09, 2024

Check No.: 2551301024



2 Version

Version No.	Date	Description
00	Dec. 09, 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 V3.3.1 (2024-09) Clause 7.1	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 V3.3.1 (2024-09) Clause 7.1	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 V3.3.1 (2024-09) Clause 7.1	EN 301 489-1 V2.2.3 (2019-11) Clause 8.4	Clause 8.4.3	PASS
Conducted Emission (telecommunication port)	ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.1	EN 301 489-1 V2.2.3 (2019-11) Clause 8.7	Clause 8.7.3	N/A
Electromagnetic Susceptibility(EMS)				
ESD (Electrostatic Discharge)	ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.2	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 V3.3.1 (2024-09) Clause 7.2	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 V3.3.1 (2024-09) Clause 7.2	EN 301 489-1 V2.2.3 (2019-11) Clause 9.4	Clause 9.4.3	PASS
Surge Immunity	ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.2	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 V3.3.1 (2024-09) Clause 7.2	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 V3.3.1 (2024-09) Clause 7.2	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 V3.3.1 (2024-09) Clause 7.2	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/A¹) The tested sample has no DC mains input/output port , therefore it is not applicable.

N/A²) The Product belongs to Class B, and its power is less than 75W, so it deems to fulfil this standard without testing.

N/A³) The tested sample is not used in the vehicle, therefore it is not applicable.

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5 General Information

5.1 Client Information

Applicant:	SHENZHEN TENDA TECHNOLOGY CO., LTD.
Address of Applicant:	6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052
Manufacturer:	SHENZHEN TENDA TECHNOLOGY CO., LTD.
Address of Manufacturer:	6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052

5.2 Product Specification subjective to this standard

Product Name:	BE5100 Dual-Band Wi-Fi 7 Router(2.5GE)
Model No.(EUT):	RE6L Pro, TE6L Pro
Model difference:	All models only have different model names. The test model is RE6L Pro
Trade Mark:	Tenda
Test Voltage:	AC 100-240V 50/60Hz
Adapter(CE) information:	Manufacture: SHENZHEN TEKA TECHNOLOGY CO., LTD. Model No.: TEKA-TC120150EU Input: AC 100-240V 50/60Hz 0.5A MAX Output: DC 12V 1.5A 18W
Adapter(UKCA) information:	Manufacture: SHENZHEN TEKA TECHNOLOGY CO., LTD. Model No.: TEKA-TC120150BS Input: AC 100-240V 50/60Hz 0.5A MAX Output: DC 12V 1.5A 18W
Test Mode:	
①	2.4G WIFI mode: The EUT connection to 2.4GWIFI works properly
②	5G WiFi mode: The EUT connection to 5G WIFI works properly
③	5G(B4) WiFi mode: The EUT connection to 5G(B4) WIFI works properly
④	Standby mode:The EUT keep to stadnby.

5.3 Other Information

Sample Received Date:	Oct. 31, 2024
Sample tested Date:	Oct. 31, 2024 to Nov. 07, 2024

5.4 Description of Support Units

No.	Device Type	Brand	Series No.	Model	Data Cable	Power Cord
1.	Netbook	HP	5CG5192QVB	HP 340G2	----	----
2.	phone	MI	44800/23NA01303	2211133C	----	----

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 Bluetooth mode 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_Hongwei-Conducted emissions				
Equipment	Manufacturer	Model	Series No.	Due Date
Receiver	R&S	ESCI	100435	04/17/2025
LISN	R&S	ENV216	100098	09/18/2025
ISN	R&S	NTFM 8158	NTFM 8158 #91	07/17/2025
ISN	TESEQ	ISN T800	30297	12/13/2024
Software-EZ	Farad Technology	--	EMC-CON 3A1.1	--

3M Semi-anechoic Chamber (2)_Hongwei-Radiated emissions				
Equipment	Manufacturer	Model	Series No.	Due Date
3M Chamber & Accessory Equipment	TDK	SAC-3	--	01/12/2027
Receiver	R&S	ESR7	101697	09/18/2025
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-401	09/13/2025
Microwave Preamplifier	Tonscend	EMC051845SE	980380	12/13/2024
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1869	04/15/2025
Software-EZ	Farad Technology	--	EMEC-3A1-Pre	--

Shielding Room No. 2_Hongwei-Voltage changes, voltage fluctuations and flicker				
Equipment	Manufacturer	Model	Series No.	Due Date
Flicker & Harmonic Tester	california instrument	300-CTS-230	1724A02035	05/30/2025
Power supply	california instrument	15003ix-CTS-400-4 13-EOS3-LF	1726A00002	05/30/2025
Software-CTS 4	California instrument	--	4.29.0	--

Shielding Room No. 1_Hongwei-Electrostatic discharge (ESD)				
Equipment	Manufacturer	Model	Series No.	Due Date
ESD Simulator	TESEQ	NSG437	1182	06/02/2025

3M Semi-anechoic Chamber (1)_Hongwei-Continuous RF electromagnetic radiated field disturbances				
Equipment	Manufacturer	Model	Series No.	Due Date
Horn Antenna	Schwarzbeck	STLP 9149	0776	06/05/2026
Stacked double Log.-Per. Antenna	Schwarzbeck	STLP9128	9128ES-110	03/21/2026

Directional coupler	BONN	BDC 1060-40/500	2128343-04	11/26/2024
RF switch	R&S	OSP220	102205	--
Power Amplifier	BONN	BLMA 1060-100	2113427	07/21/2025
Power Amplifier	R&S	BBA 150-BC500	104743	05/30/2025
Power Probe	R&S	NRP6A	103343	06/24/2025
Power Probe	R&S	NRP6A	103342	06/24/2025
Signal Generator	R&S	SMB 100B	103084	05/12/2025
3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	05/19/2025
Software-EMC-32	R&S	--	V10.60.20-Y267_ FU	--

Shielding Room No. 1_Hongwei-Electrical fast transients/burst (EFT/B)				
Equipment	Manufacturer	Model	Series No.	Due Date
Electric fast transient pulse group simulator	3ctest	EFT 600T	ES027000923002	04/27/2025
Capacitive coupling clamp	3C TEST	CCC 100	221116159	05/14/2025

Shielding Room No. 1_Hongwei-Surges				
Equipment	Manufacturer	Model	Series No.	Due Date
Surge generator	3ctest	SG-5010H	EC5531306	01/28/2025
Unshielded symmetric high speed communication line surge coupled decoupling network	3C TEST	CDN 405T8A1	ES2731509	08/20/2025

Shielding Room No. 2_Hongwei-Continuous induced RF disturbances				
Equipment	Manufacturer	Model	Series No.	Due Date
Conducted immunity test system	TESEQ	NSG 4070C-80	59089	06/25/2025
CDN	TESEQ	CDN M516AS	59088	09/01/2025
Attenuator	BIRD	75-A-MFN-06	0543	06/24/2025
Software-NSG 4070 Control Program	TESEQ	--	1.4.0	--
EM-Clamp	EM TEST	EM101	35770	03/07/2025

Shielding Room No. 2_Hongwei-Voltage dips and interruptions				
Equipment	Manufacturer	Model	Series No.	Due Date
Power supply	california instrument	15003ix-CTS-400-4 13-EOS3-LF	1726A00002	05/30/2025
Electronic switch	california instrument	EOS3-230	1726A00001	09/18/2025
Software-AC Source CIG uiSII	California instrument	--	3.2.0	--

7 EMC Requirements Specification

7.1 EMI (Emission)

7.1.1 Radiated Emission

Test Requirement: ETSI EN 301 489-3 V2.3.2 (2023-01) Clause 7.1,
ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.1

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

EUT Operation:

Ambient: Temp.: 24°C Humid.: 54% Press.: 1010mbar

Test Mode: ①②③

Test Status: Pretest the EUT at different test mode and found the ③ 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:

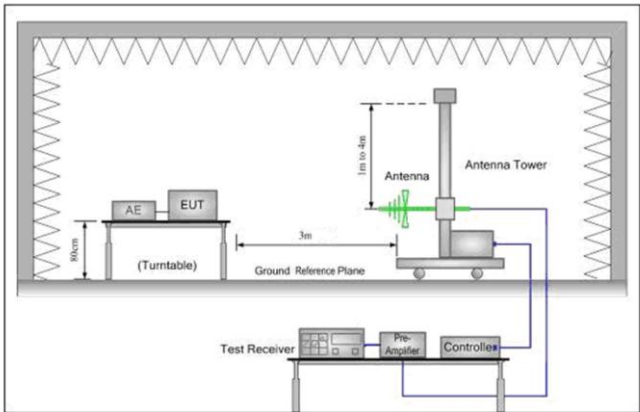


Figure 1. 30MHz to 1GHz

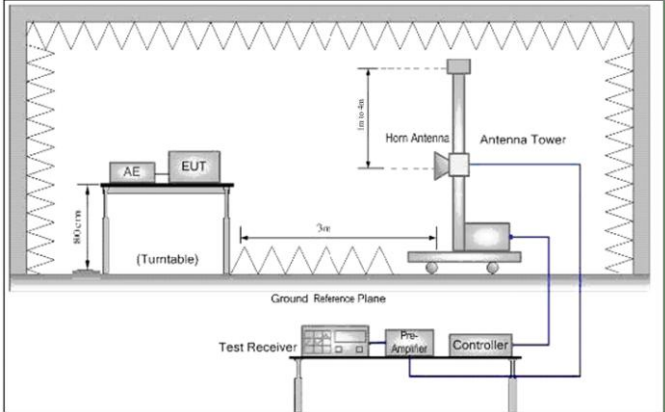


Figure 2. Above 1 GHz

Test Procedure:

1. From 30 MHz to 1GHz 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
- Refer to section 6 for details.

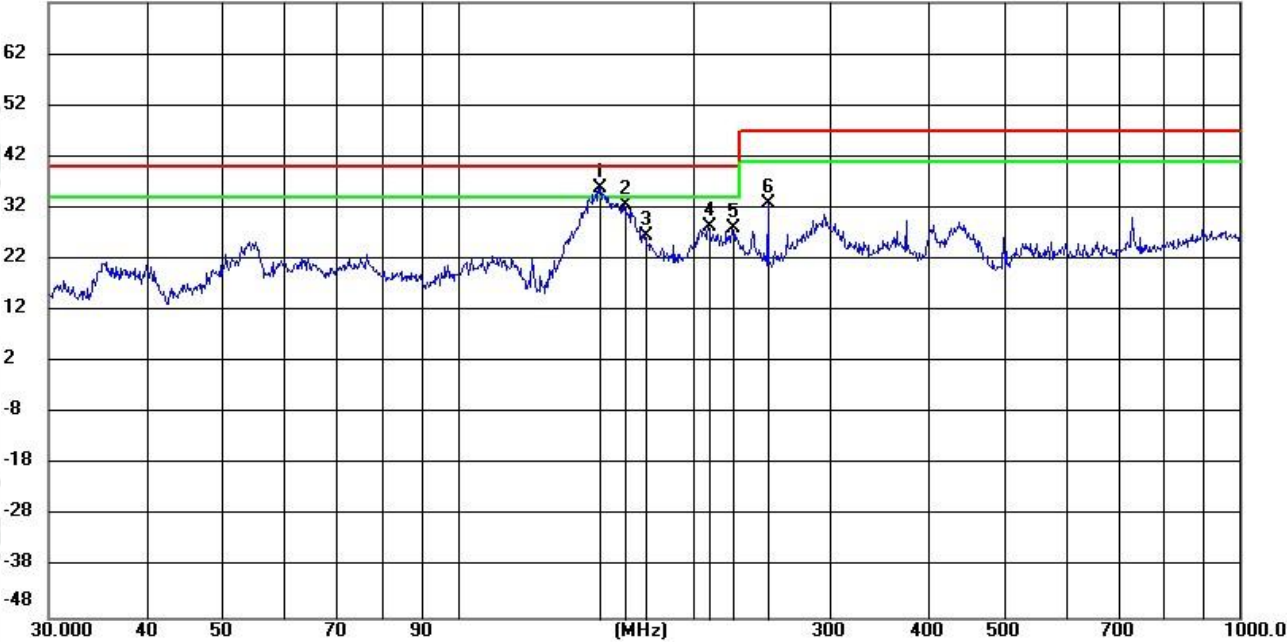
Equipment Used:

Test result:

PASS

Measurement Data:
Below 1GHz (QP) :

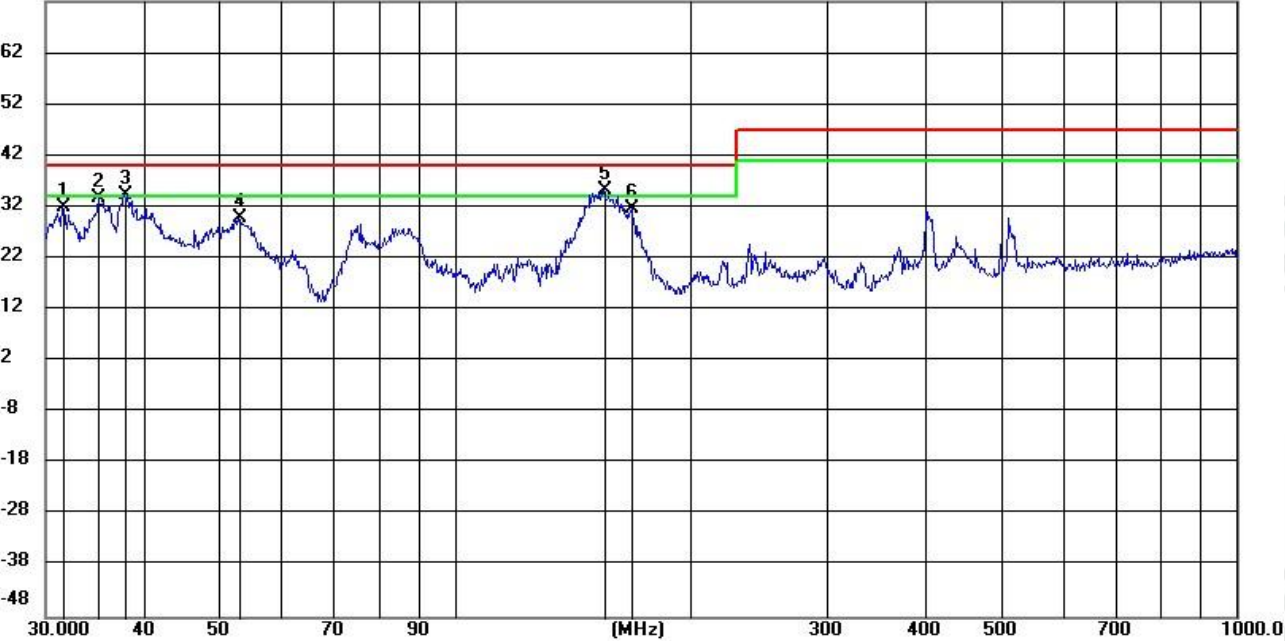
Horizontal
72.0 dBuV/m



No.	Mk.	Freq.	Reading	Correct	Measurement	Limit	Margin		Antenna	Table
		MHz	Level	Factor					Height	Degree
			dBuV		dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	151.8366	26.57	9.32	35.89	40.00	-4.11	QP	100	168
2		163.3821	22.12	10.37	32.49	40.00	-7.51	QP	100	189
3		173.9049	15.17	11.28	26.45	40.00	-13.55	QP	100	157
4		209.4230	15.71	12.74	28.45	40.00	-11.55	QP	100	157
5		225.1105	14.76	13.33	28.09	40.00	-11.91	QP	100	189
6		249.9941	18.57	14.26	32.83	47.00	-14.17	QP	200	28

Vertical

72.0 dBuV/m

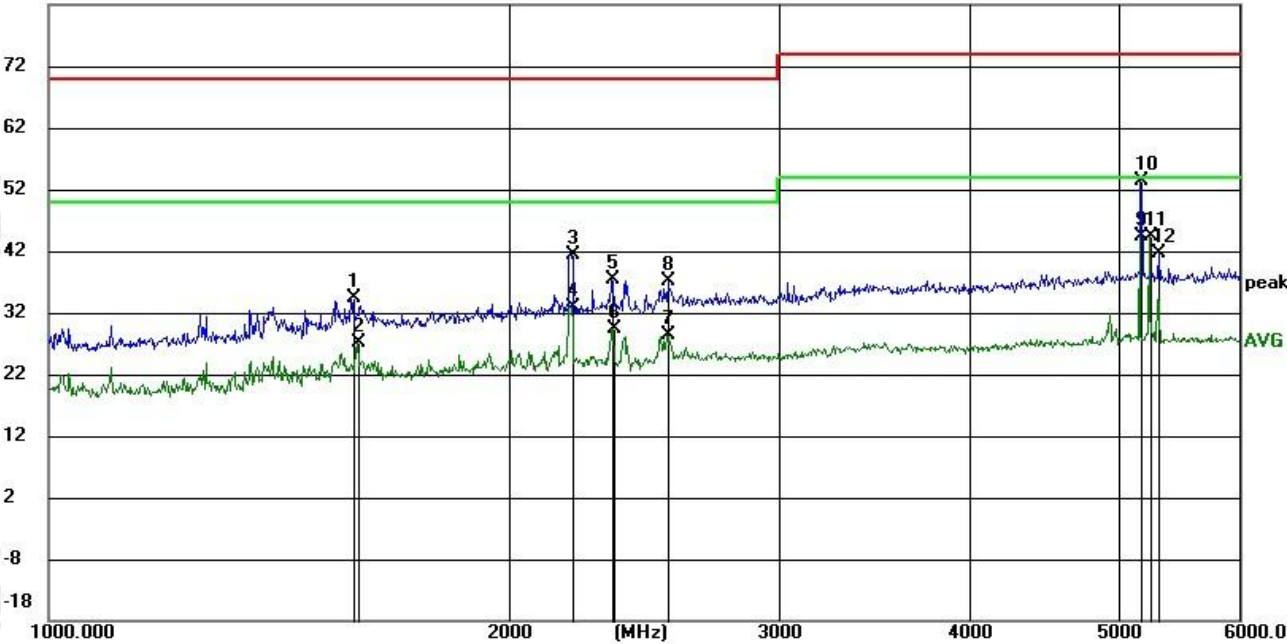


No.	Mk.	Freq.	Reading	Correct	Measurement	Limit	Margin	Antenna	Table
		MHz	Level	Factor				Height	Degree
			dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree
1		31.6146	19.73	12.11	31.84	40.00	-8.16	QP 100	95
2		35.0970	21.32	12.56	33.88	40.00	-6.12	QP 200	42
3	!	37.9250	21.48	12.93	34.41	40.00	-5.59	QP 100	352
4		53.0196	17.10	12.79	29.89	40.00	-10.11	QP 100	20
5	*	155.8281	26.86	8.31	35.17	40.00	-4.83	QP 100	53
6		168.7980	21.83	9.74	31.57	40.00	-8.43	QP 100	42

Above 1GHz:

Horizontal

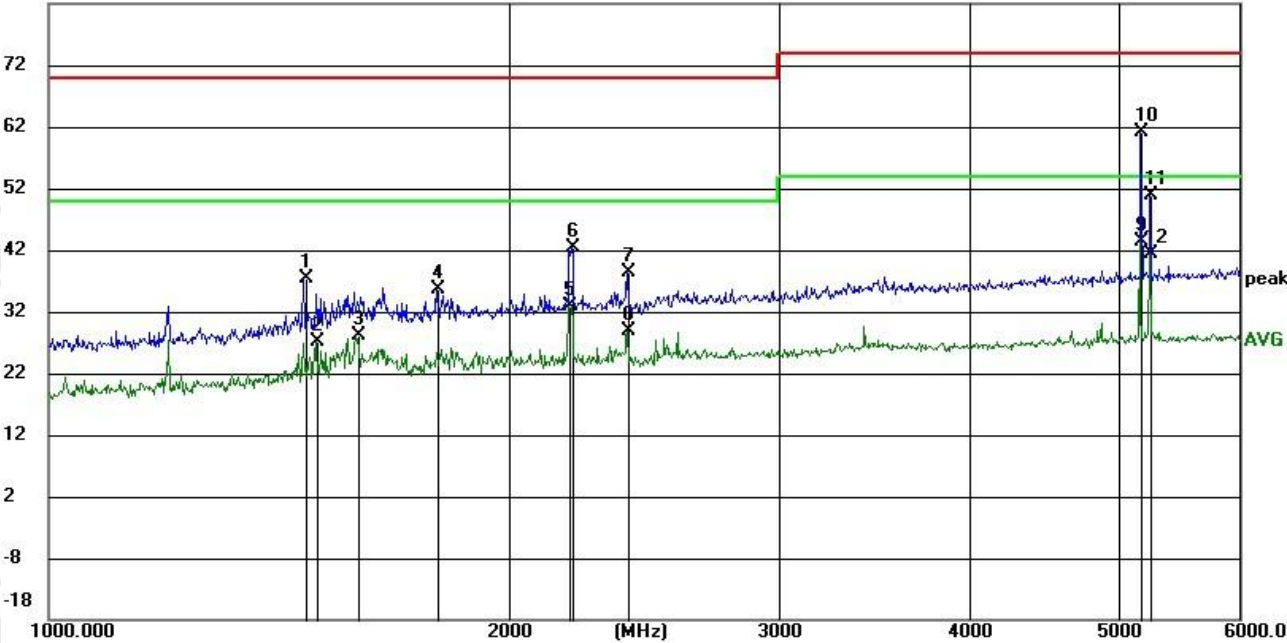
82.0 dBuV/m



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		1579.593	48.72	-14.43	34.29	70.00	-35.71	peak	200	117
2		1593.380	41.49	-14.31	27.18	50.00	-22.82	AVG	100	117
3		2199.423	51.52	-10.05	41.47	70.00	-28.53	peak	100	100
4		2199.423	42.98	-10.05	32.93	50.00	-17.07	AVG	100	100
5		2337.786	46.66	-9.21	37.45	70.00	-32.55	peak	100	251
6		2338.624	38.65	-9.21	29.44	50.00	-20.56	AVG	100	251
7		2542.501	36.47	-8.07	28.40	50.00	-21.60	AVG	100	352
8		2543.185	45.29	-8.07	37.22	70.00	-32.78	peak	100	251
9		5173.663	44.13	0.14	44.27	54.00	-9.73	AVG	100	217
10		5177.836	53.31	0.15	53.46	74.00	-20.54	peak	100	50
11	*	5249.767	44.08	0.32	44.40	54.00	-9.60	AVG	200	50
12		5318.885	41.22	0.49	41.71	74.00	-32.29	peak	100	83

Vertical

82.0 dBuV/m



No.	Mk.	Freq.	Reading	Correct	Measurement	Limit	Margin	Antenna	Table
		MHz	Level	Factor				Height	Degree
			dBuV	dB/m	dBuV/m	dBuV/m	dB	cm	degree
1		1469.950	52.57	-15.24	37.33	70.00	-32.67	peak	158
2		1496.793	42.25	-15.05	27.20	50.00	-22.80	AVG	175
3		1593.094	42.41	-14.32	28.09	50.00	-21.91	AVG	208
4		1794.365	48.48	-12.80	35.68	70.00	-34.32	peak	175
5		2191.163	42.92	-10.10	32.82	50.00	-17.18	AVG	124
6		2198.438	52.32	-10.05	42.27	70.00	-27.73	peak	124
7		2390.094	47.34	-8.89	38.45	70.00	-31.55	peak	326
8		2390.094	37.73	-8.89	28.84	50.00	-21.16	AVG	326
9	*	5177.372	43.24	0.15	43.39	54.00	-10.61	AVG	7
10		5177.836	61.09	0.15	61.24	74.00	-12.76	peak	192
11		5250.238	50.66	0.33	50.99	74.00	-23.01	peak	124
12		5250.238	41.03	0.33	41.36	54.00	-12.64	AVG	124

Note:

- 1. Margin=Measurement-Limit.
- 2. Measurement=Reading_Level+Correct Factor.

7.1.2 Conducted Emission

1) For AC Main Port

Test Requirement: ETSI EN 301 489-3 V2.3.2 (2023-01) Clause 7.1,
ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.1

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.: 23°C Humid.: 54% Press.: 1010 mbar

Test Mode: ①②③

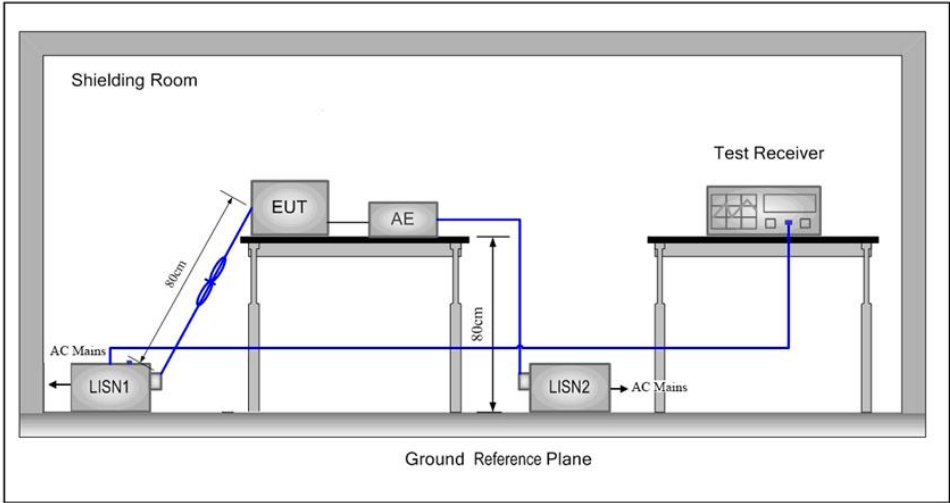
Test Status: Pretest the EUT at different test mode and found the ② is worst case, the test worst case mode is recorded in the report.

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

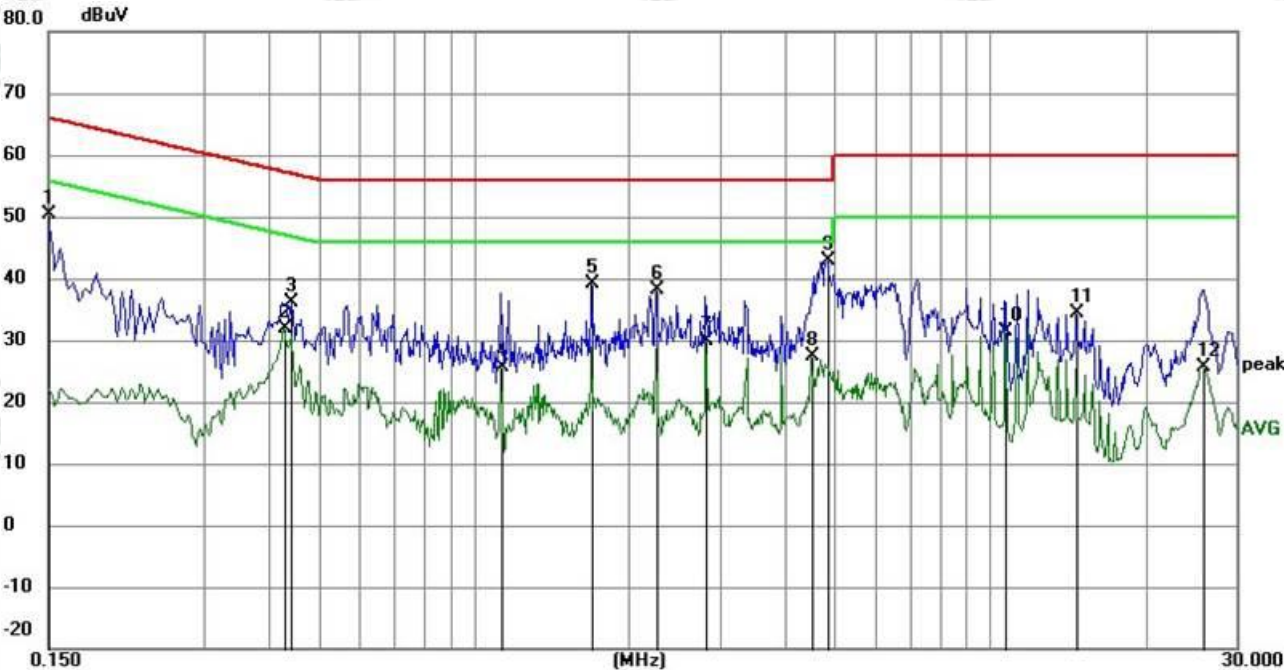
equipment was at least 0.8 m from the LISN 2.

Test result: PASS

Measurement Data:

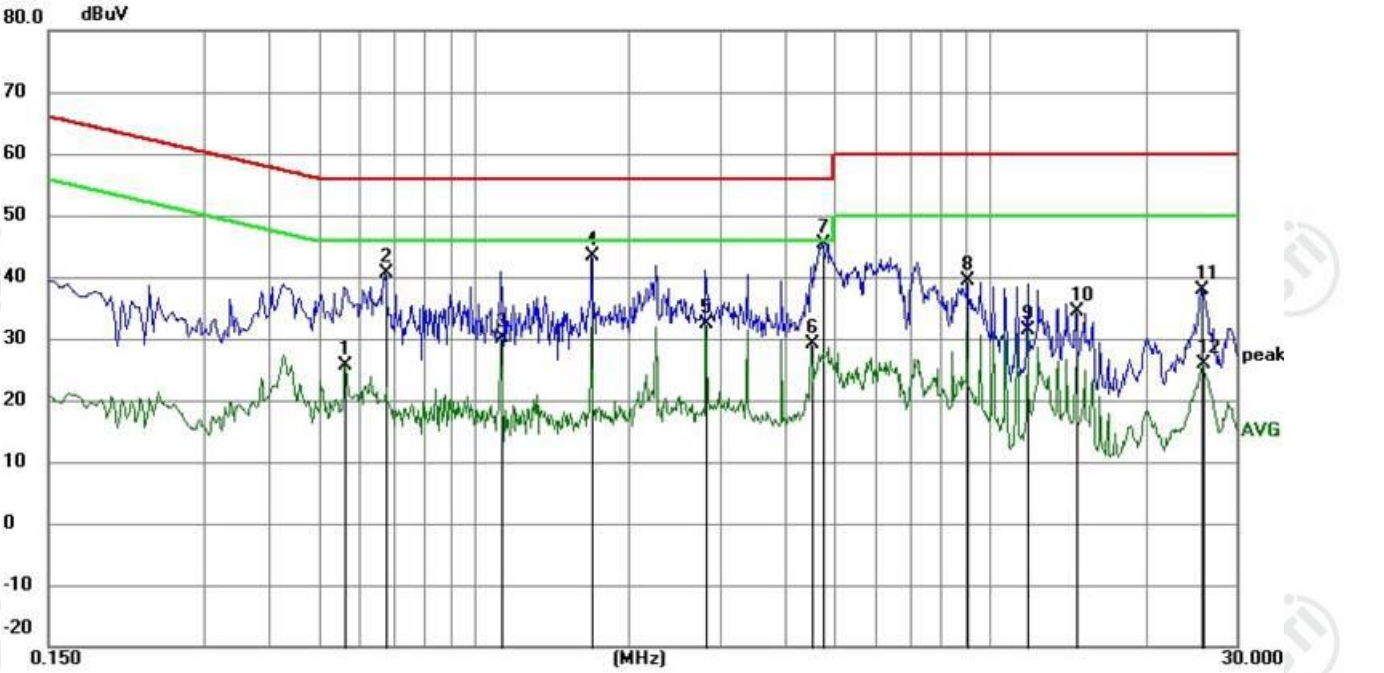
An initial pre-scan was performed on the live and neutral lines with peak detector.
Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live Line:



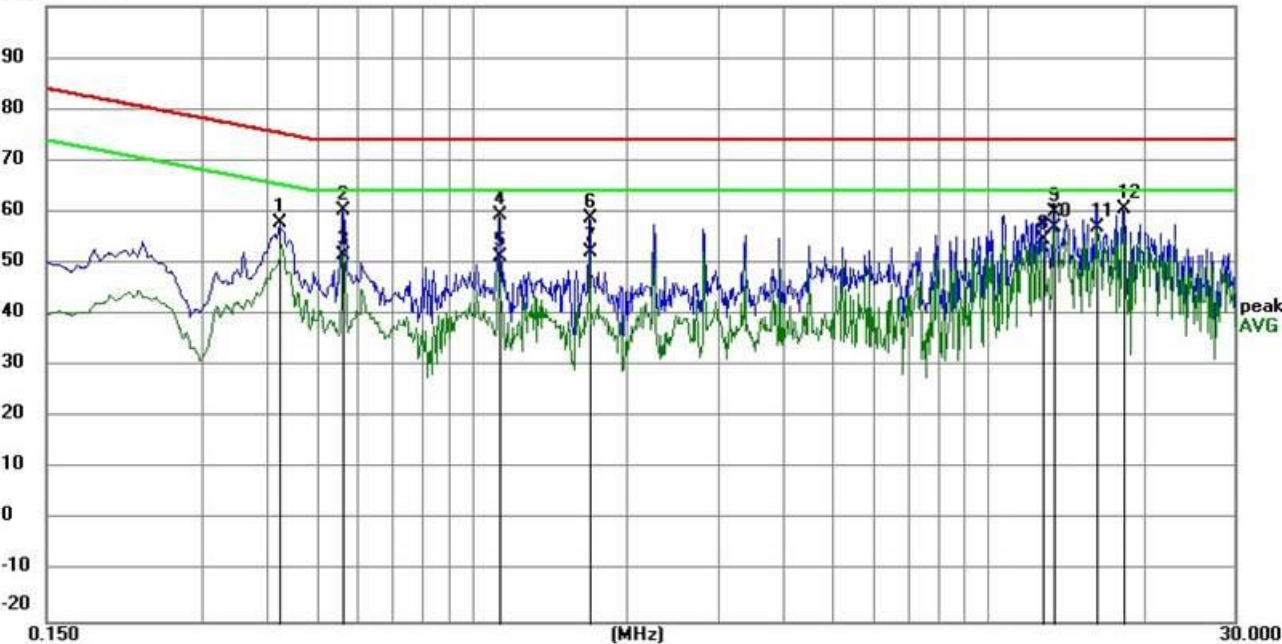
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV	dBuV	dB	
1		0.1500	40.64	9.84	50.48	66.00	-15.52	QP
2		0.4290	21.97	9.79	31.76	47.27	-15.51	AVG
3		0.4425	26.39	9.79	36.18	57.01	-20.83	QP
4		1.1310	15.87	9.74	25.61	46.00	-20.39	AVG
5		1.6935	29.46	9.75	39.21	56.00	-16.79	QP
6		2.2559	28.40	9.76	38.16	56.00	-17.84	QP
7		2.8230	20.03	9.77	29.80	46.00	-16.20	AVG
8		4.5195	17.65	9.83	27.48	46.00	-18.52	AVG
9	*	4.8570	33.16	9.84	43.00	56.00	-13.00	QP
10		10.7295	21.67	9.83	31.50	50.00	-18.50	AVG
11		14.6805	24.57	9.85	34.42	60.00	-25.58	QP
12		25.8134	15.79	9.89	25.68	50.00	-24.32	AVG

Neutral Line:



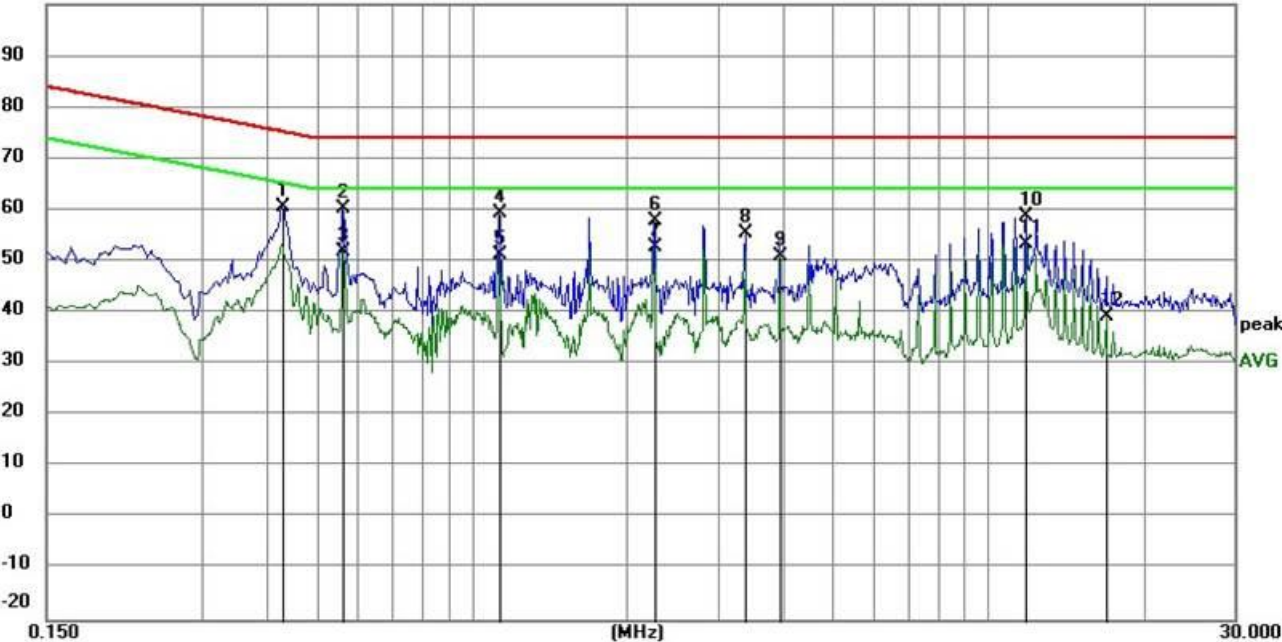
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV	dBuV	dB	
1		0.5639	16.03	9.66	25.69	46.00	-20.31	AVG
2		0.6720	30.85	9.89	40.74	56.00	-15.26	QP
3		1.1310	20.35	9.74	30.09	46.00	-15.91	AVG
4		1.6935	33.56	9.75	43.31	56.00	-12.69	QP
5		2.8230	22.60	9.77	32.37	46.00	-13.63	AVG
6		4.5195	19.33	9.83	29.16	46.00	-16.84	AVG
7	*	4.7220	35.61	9.83	45.44	56.00	-10.56	QP
8		9.0330	29.49	9.84	39.33	60.00	-20.67	QP
9		11.8545	21.58	9.84	31.42	50.00	-18.58	AVG
10		14.6760	24.44	9.85	34.29	60.00	-25.71	QP
11		25.6695	28.07	9.90	37.97	60.00	-22.03	QP
12		25.7865	16.07	9.90	25.97	50.00	-24.03	AVG

100Mbps
100.0 dBuV



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV	dBuV	dB	
1		0.4245	48.46	9.45	57.91	75.36	-17.45	QP
2		0.5639	50.80	9.49	60.29	74.00	-13.71	QP
3		0.5639	41.96	9.49	51.45	64.00	-12.55	AVG
4		1.1310	49.75	9.47	59.22	74.00	-14.78	QP
5		1.1310	41.71	9.47	51.18	64.00	-12.82	AVG
6		1.6935	49.34	9.46	58.80	74.00	-15.20	QP
7		1.6935	42.79	9.46	52.25	64.00	-11.75	AVG
8		12.7455	44.97	9.54	54.51	64.00	-9.49	AVG
9		13.3575	50.33	9.53	59.86	74.00	-14.14	QP
10		13.4205	47.32	9.53	56.85	64.00	-7.15	AVG
11	*	16.2285	47.53	9.47	57.00	64.00	-7.00	AVG
12		18.2445	51.23	9.41	60.64	74.00	-13.36	QP

1000Mbps
100.0 dBuV



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV	dBuV	dB	
1		0.4290	50.76	9.85	60.61	75.27	-14.66	QP
2		0.5639	50.59	9.79	60.38	74.00	-13.62	QP
3		0.5639	41.91	9.79	51.70	64.00	-12.30	AVG
4		1.1310	49.66	9.64	59.30	74.00	-14.70	QP
5		1.1310	41.70	9.64	51.34	64.00	-12.66	AVG
6		2.2605	48.00	9.81	57.81	74.00	-16.19	QP
7		2.2605	42.84	9.81	52.65	64.00	-11.35	AVG
8		3.3900	45.62	9.74	55.36	74.00	-18.64	QP
9		3.9525	41.18	9.70	50.88	64.00	-13.12	AVG
10		11.8635	49.33	9.50	58.83	74.00	-15.17	QP
11	*	11.8635	43.92	9.50	53.42	64.00	-10.58	AVG
12		16.9440	29.64	9.64	39.28	64.00	-24.72	AVG

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

7.2 EMS (Immunity)

Performance Criteria of EN 301 489-3, sub clause 6.2 table 2.

Table 2: Performance Requirements

Criterion	During test	After 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

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.		

7.2.1 Radiated Immunity

Test Requirement:

ETSI EN 301 489-3 V2.3.2 (2023-01) Clause 7.1,
ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.2
EN 301 489-1 V2.2.3 (2019-11) Clause 9.2

Test Method:

EUT Operation:

Ambient:

Temp.: 22°C

Humid.:52%

Press.: 1010 mbar

Test Mode:

①②③④

Criterion Required:

A

Equipment Used:

Refer to section 6 for details.

Test Setup:

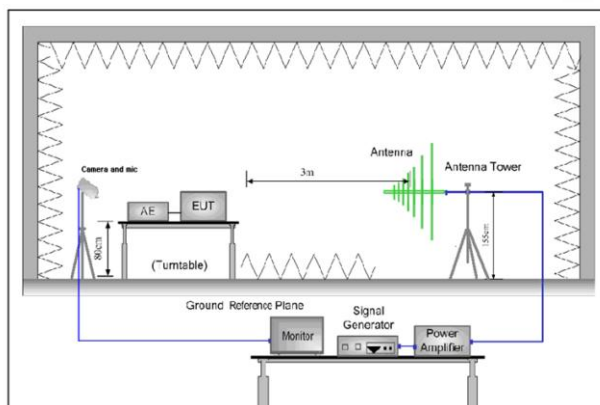


Figure 1. 80MHz to 1GHz

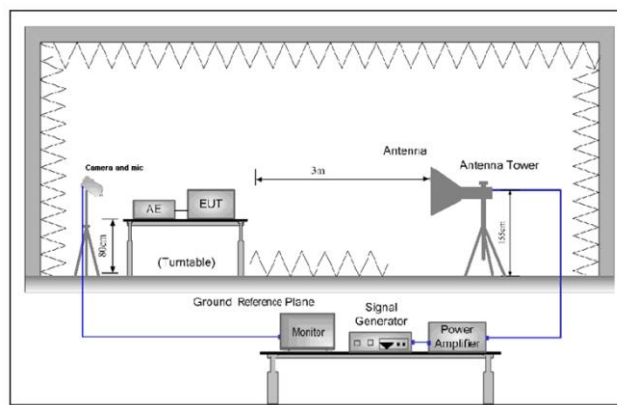


Figure 2. 1GHz to 6GHz

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
			Top	V	A
				H	A
			Under	V	A
				H	A

Remark:

A: No performance degradation during test.

7.2.2 ESD

Test Requirement: ETSI EN 301 489-3 V2.3.2 (2023-01) Clause 7.1,
ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.2

Test Method: EN 301 489-1 V2.2.3 (2019-11) Clause 9.3

EUT Operation:

Ambient: Temp.: 23°C Humid.: 56% Press.: 1010mbar

Test Mode: ①②③④

Criterion Required: B

Discharge Impedance: 330 Ω / 150 pF

Polarity: Positive & Negative

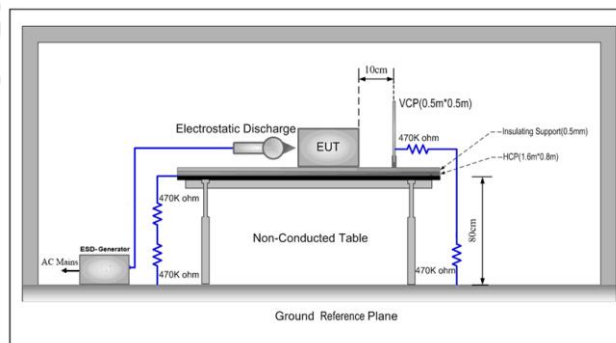
Number of Discharge: Minimum 10 times at each test point

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 & thickness 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	A	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 301 489-3 V2.3.2 (2023-01) Clause 7.1,
ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.2

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.: 50%

Press.: 1010 mbar

Test Mode: ①②③④

Equipment Used: Refer to section 6 for details.

Test Setup:

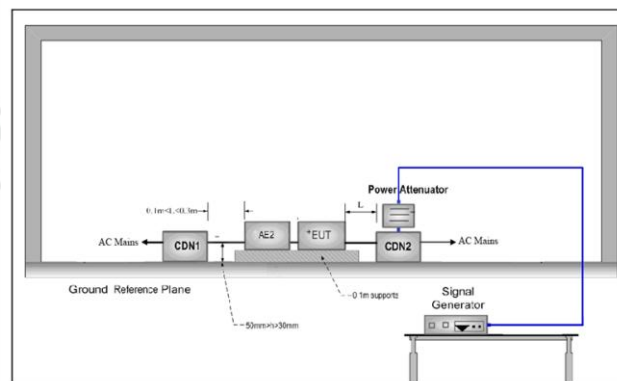


Figure 1. For AC port

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%	2 S	A
150kHz to 80MHz	LAN port	3Vrms	80%, 1kHz Amp. Mod.	1%	2 S	A

Remark:

A: No performance degradation during test.

7.2.4 Electrical Fast Transients (EFT)

Test Requirement:	ETSI EN 301 489-3 V2.3.2 (2023-01) Clause 7.1, ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.2		
Test Method:	EN 301 489-1 V2.2.3 (2019-11) Clause 9.4		
Test Level:	$\pm 0.5\text{kV}, \pm 1.0\text{kV}$ on AC port.		
Polarity:	Positive & Negative		
Repetition Frequency:	5kHz		
Burst Period:	300ms		
Test Duration:	2 minute per level & polarity		
EUT Operation:			
Ambient:	Temp.: 24°C	Humid.: 53%	Press.: 1010mbar
Test Mode:	①②③④		
Equipment Used:	Refer to section 6 for details.		
Test Setup:			

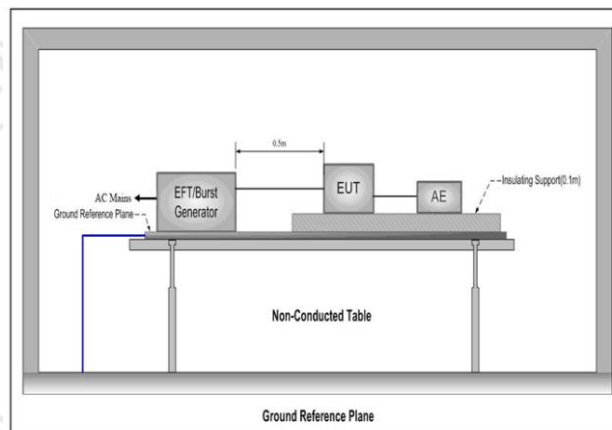


Figure 1. For AC port

- 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	①②③④	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 301 489-3 V2.3.2 (2023-01) Clause 7.1,
ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.2

Test Method: EN 301 489-1 V2.2.3 (2019-11) Clause 9.8

Test Level: For AC port
 $\pm 1\text{kV}$ 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.: 53%

Press.: 1010mbar

Test Mode: ①②③④

Equipment Used: Refer to section 6 for details.

Test Setup:

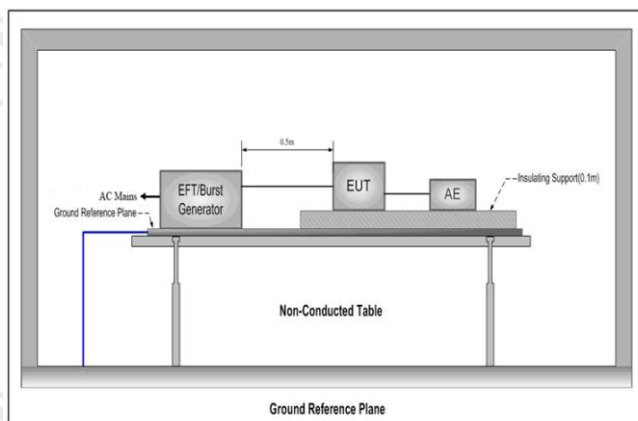


Figure 1. For AC port

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 $1.2/50 \mu\text{s}$ 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 2Ω 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
41-45	LAN port	± 0.5	60s	-	A

Remark:

A: No performance degradation during test.

7.2.6 Voltage Dips and Interruptions

Test Requirement: ETSI EN 301 489-17 V3.3.1 (2024-09) Clause 7.2
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).

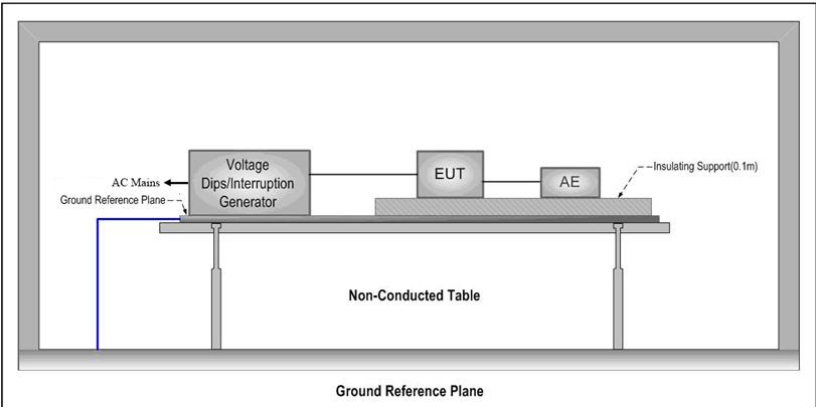
No. of Dips / Interruptions: 3 per Level

EUT Operation:

Ambient: Temp.: 23°C Humid.: 50% Press.:1010mbar

Test Mode: ①②③④

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	A

Remark:

A: No performance degradation during test.

APPENDIX PHOTOGRAPHS OF TEST SETUP



Conducted emissions Test Setup-1



Conducted emissions Test Setup-2



Conducted emissions Test Setup-3



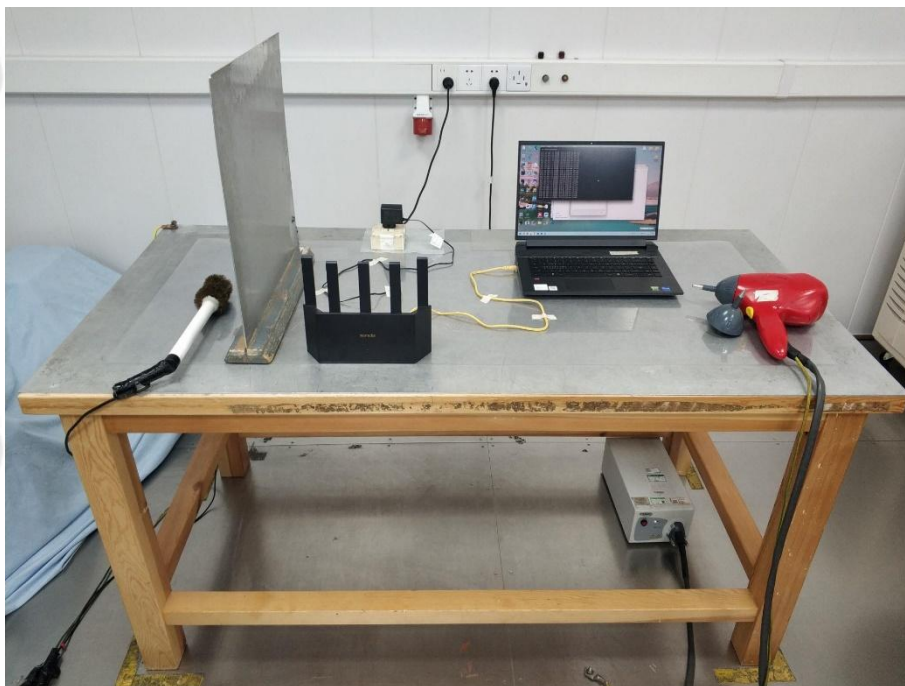
Radiated emissions Test Setup-1



Radiated emissions Test Setup-2



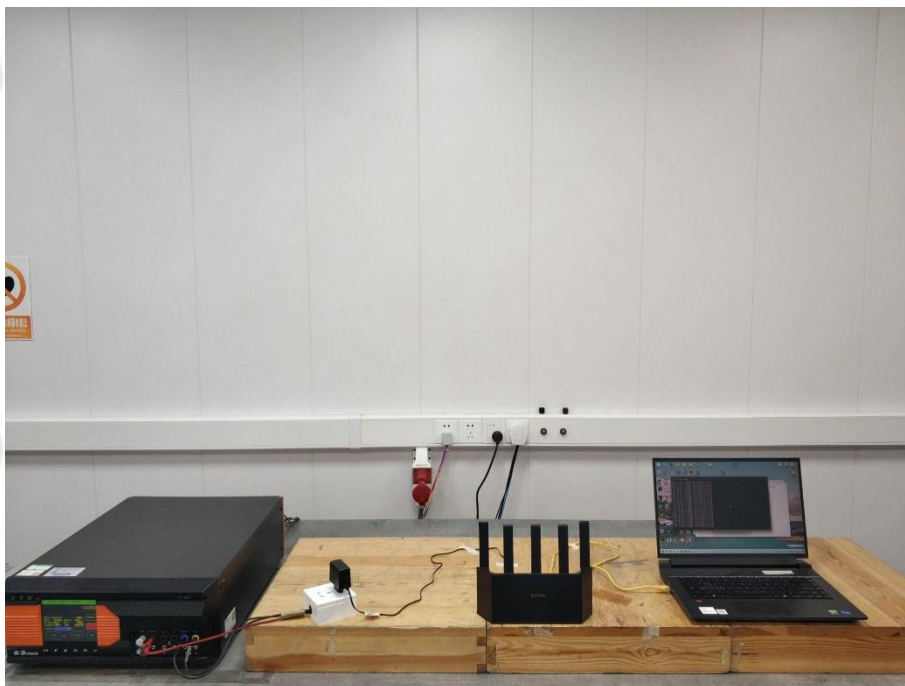
Voltage changes voltage fluctuations and flicker Test Setup-2



Electrostatic discharge Test Setup-1



Continuous RF electromagnetic radiated field disturbances Test Setup-1



Electrical fast transients burst Test Setup-1



Electrical fast transients burst Test Setup-2



Surges Test Setup-1



Surges Test Setup-2



Surges Test Setup-3



Continuous induced RF disturbances Test Setup-1



Continuous induced RF disturbances Test Setup-3



Voltage dips and interruptions Test Setup-2

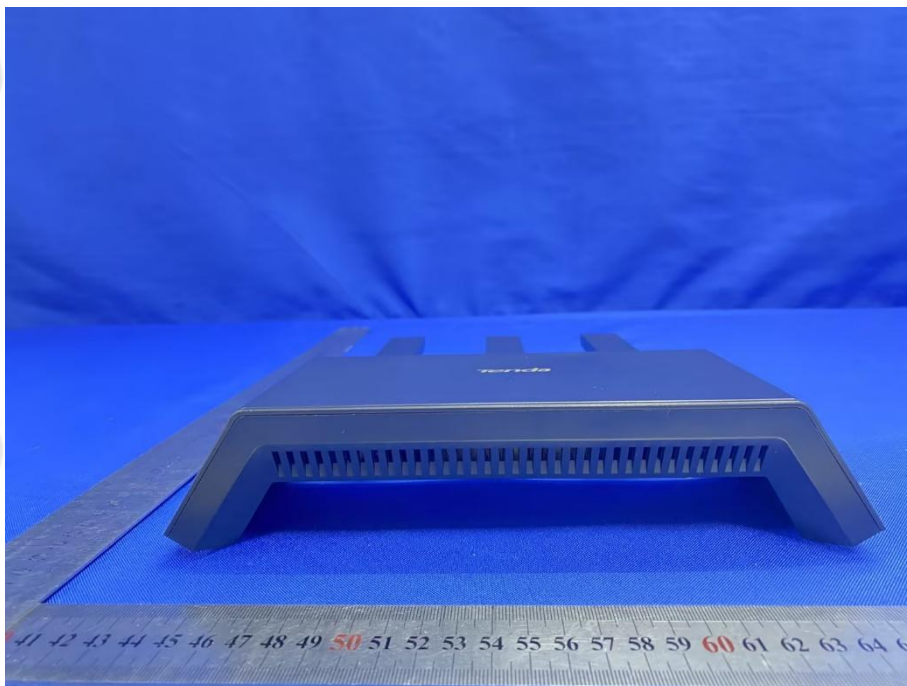
APPENDIX PHOTOGRAPHS OF EUT



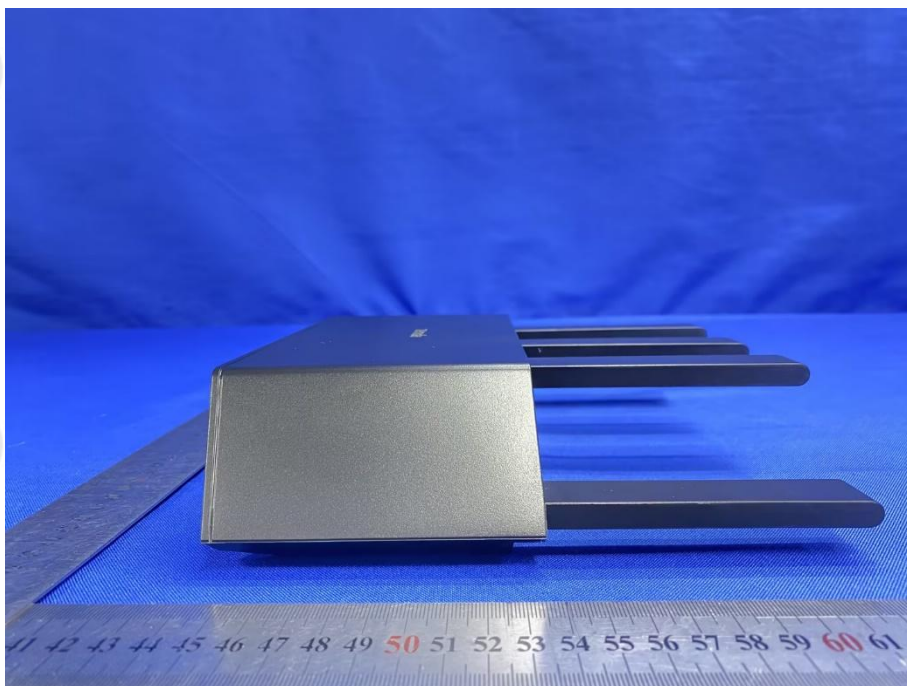
View Of Product-01



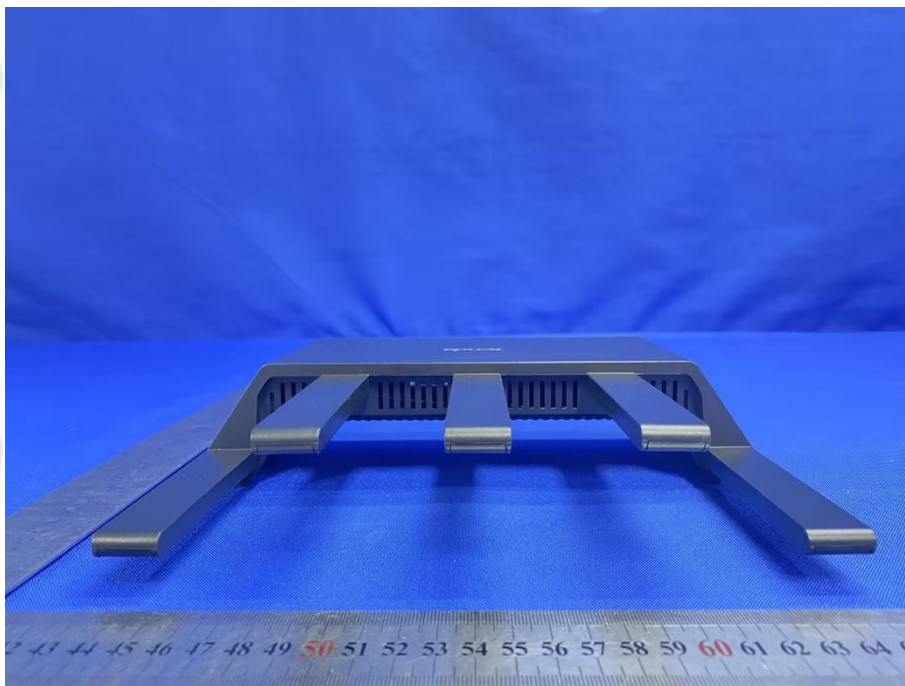
View Of Product-02



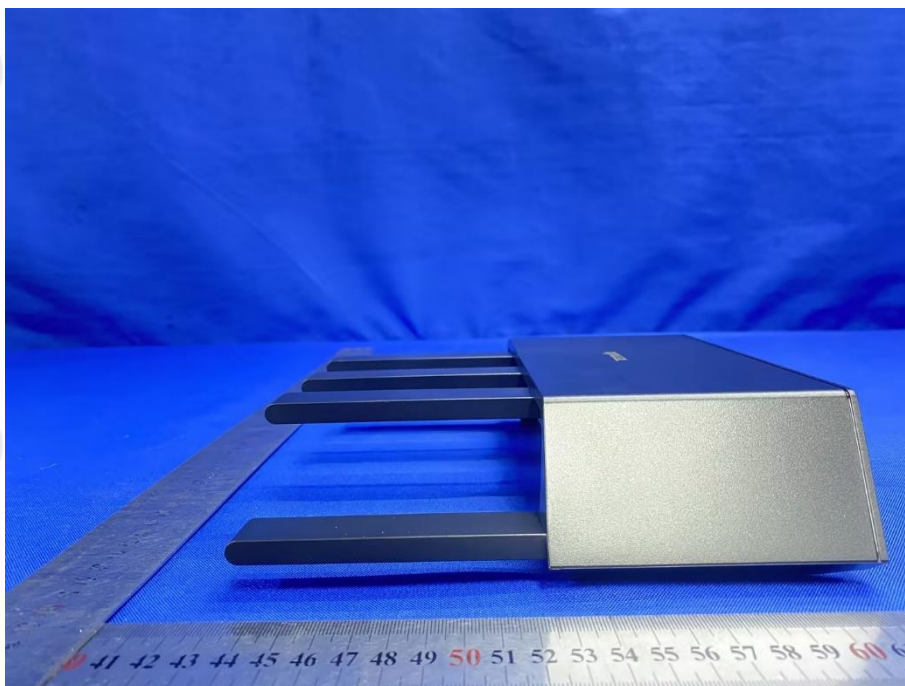
View Of Product-03



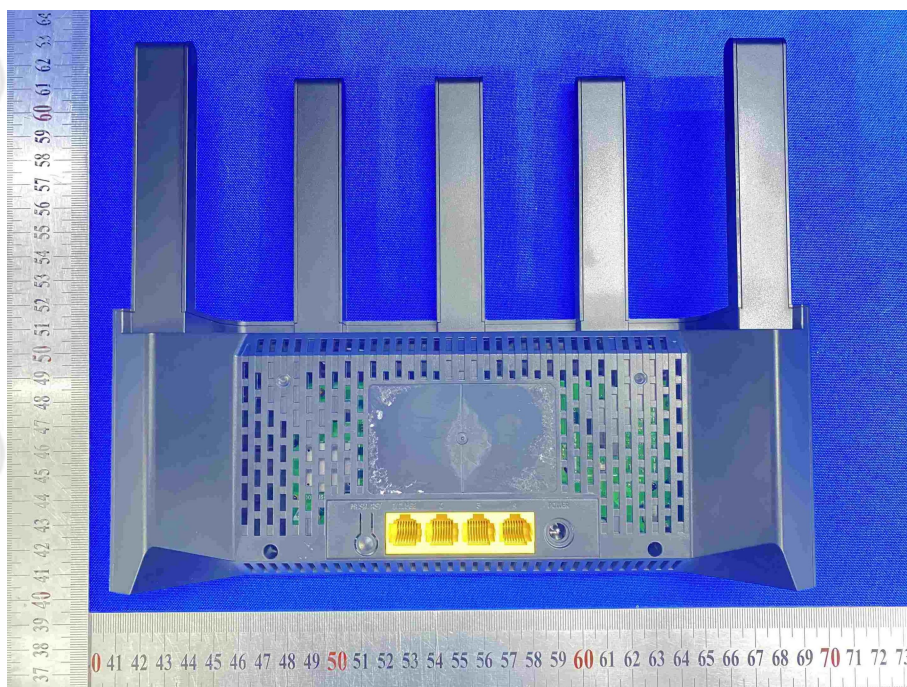
View Of Product-04



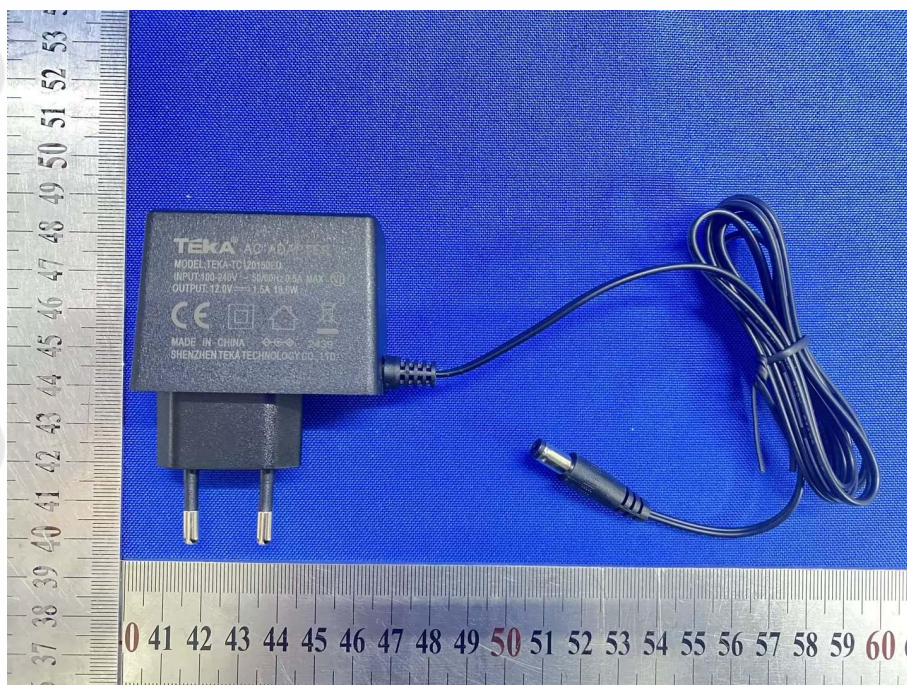
View Of Product-05



View Of Product-06



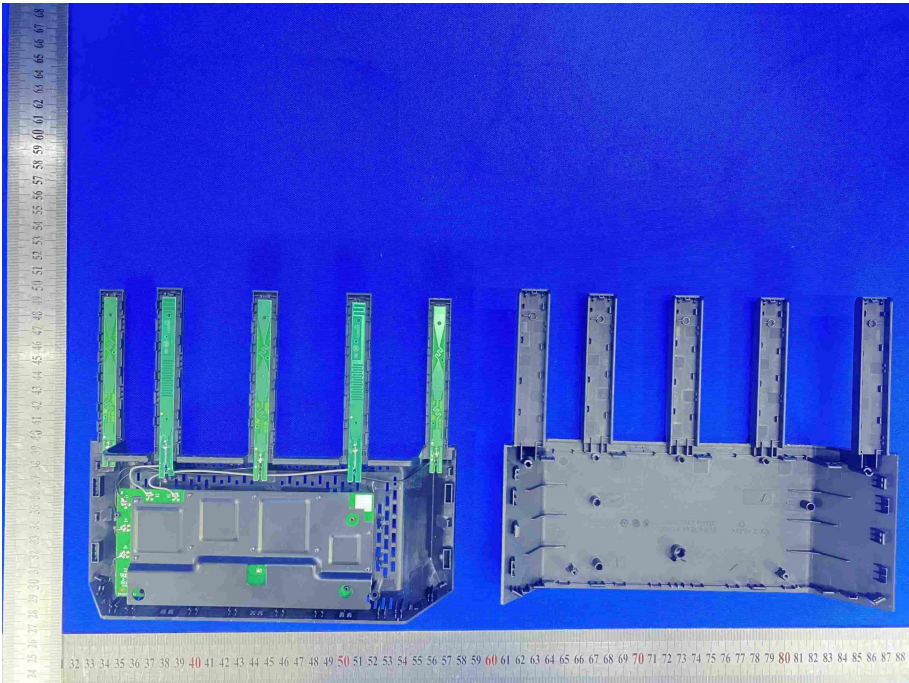
View Of Product-07



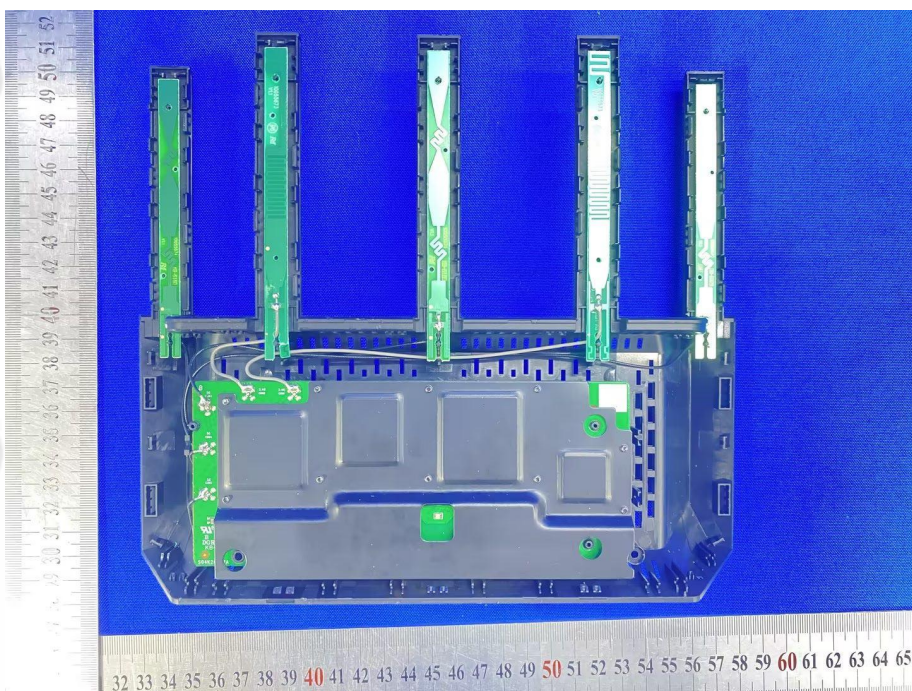
View Of Product-08



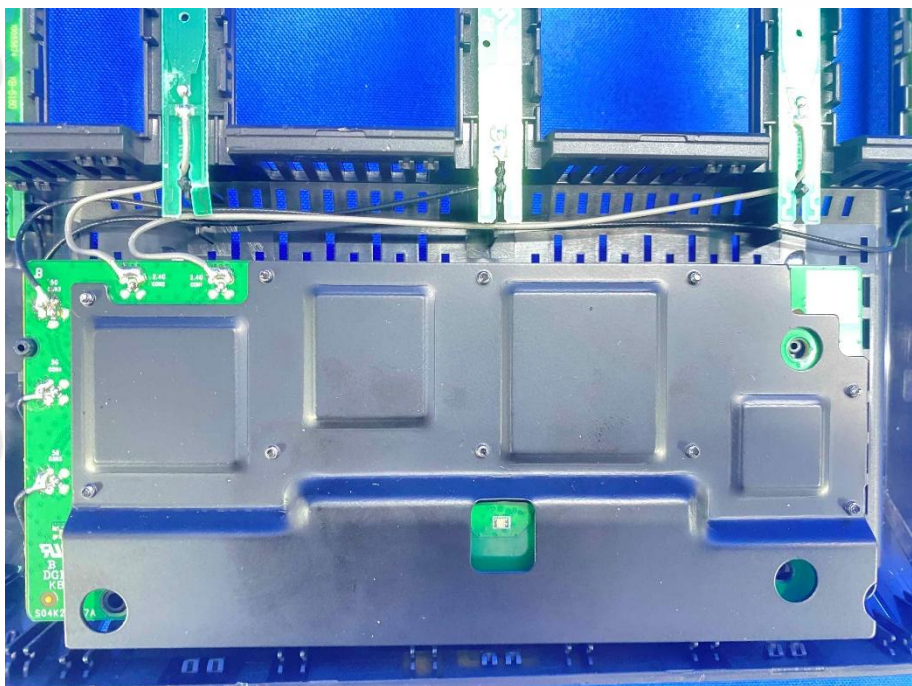
View Of Product-09



View Of Product-10



View Of Product-11



View Of Product-12



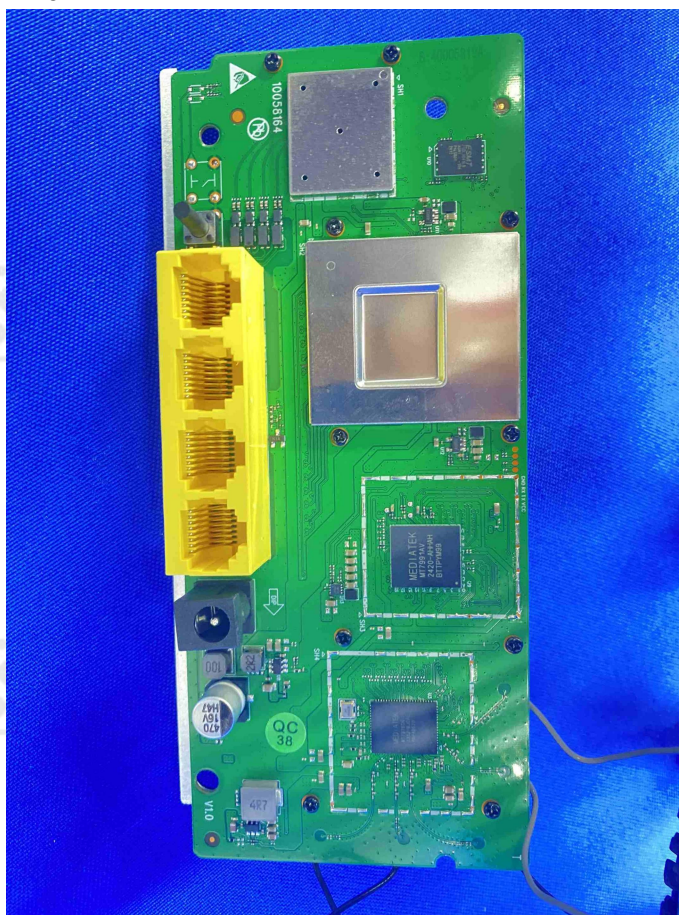
View Of Product-13



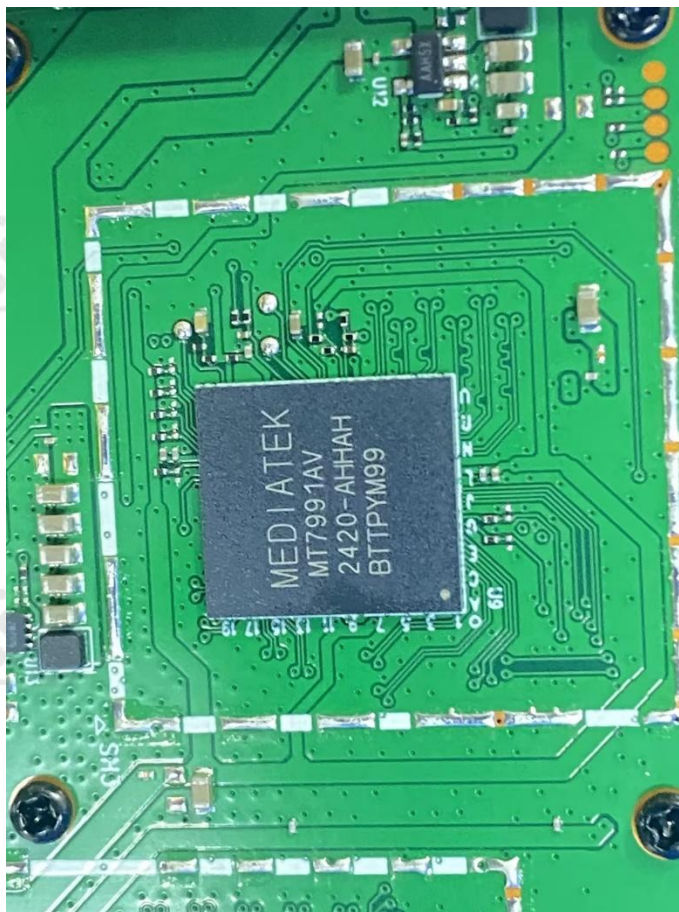
View Of Product-14



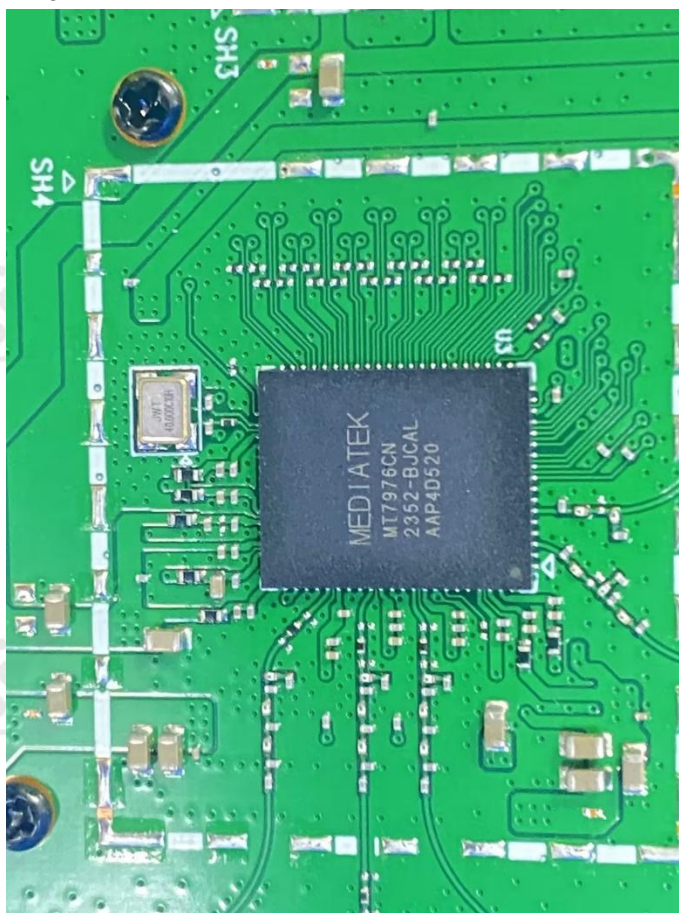
View Of Product-15



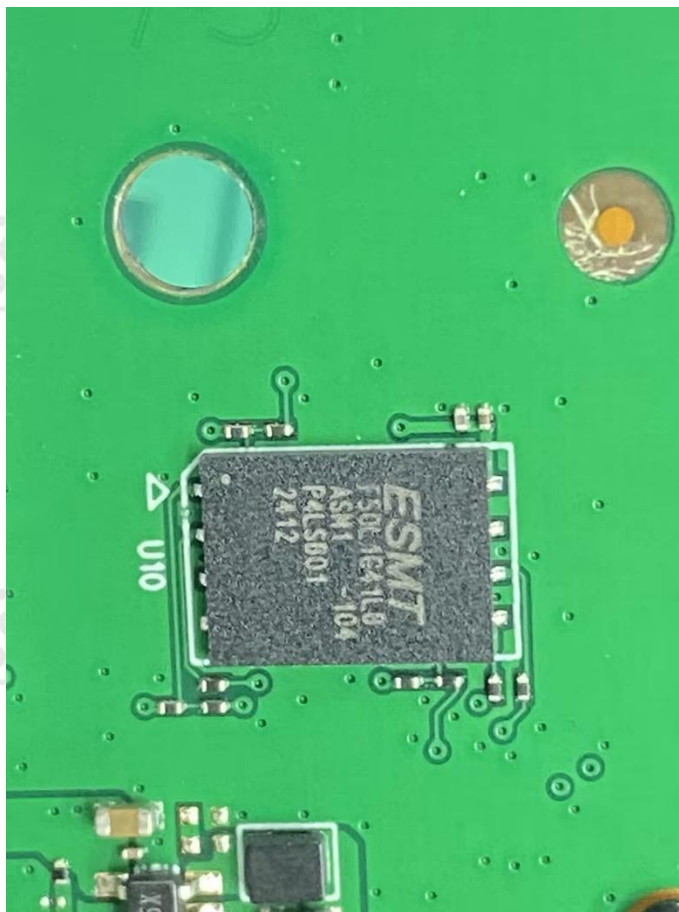
View Of Product-16



View Of Product-17



View Of Product-18



View Of Product-19



View Of Product-20



View Of Product-21

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*** End of Report ***