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CNAS L5662

ETSI EN 301 489-1 V2.2.3 (2019-11)
ETSI EN 301 489-17 V3.2.4 (2020-09)

TEST REPORT

For

SHENZHEN TENDA TECHNOLOGY CO.,LTD.

6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052

Tested Model: Mesh12X
Multiple Models: MX12, EX12, EM12

Report Type: Original Report	**Product Type:** AX3000 Whole Home Mesh Wi-Fi 6 System
Report Number:	DG2220216-04699E-02
Report Date:	2022-07-20
Reviewed By:	Rocky Xiao RF Engineer
Approved By:	Ivan Cao Assistant Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.12, Pulong East 1st Road, Tangxia Town, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:		AX3000 Whole Home Mesh Wi-Fi 6 System
EUT Model:		Mesh12X
Multiple Models:		MX12,EX12,EM12
Model Difference:		Refer to Dos
Rated Input Voltage:		12Vdc from adapter
Adapter Information	**Model:**	BN067-A18012E
	Input:	100-240Vac 50/60Hz 0.6A
	Output:	12Vdc 1.5A
Serial Number:		DG2220216-04699E-RF-S1
EUT Received Date:		2022.02.18
EUT Received Status:		Good

Objective

This report is prepared on behalf of ***SHENZHEN TENDA TECHNOLOGY CO.,LTD.*** in accordance with ETSI EN 301 489-1 V2.2.3 (2019-11) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility; ETSI EN 301 489-17 V3.2.4 (2020-09) ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility;

The objective is to determine the compliance of EUT with: ETSI EN 301 489-1&17.

Test Methodology

All measurements contained in this report were conducted with ETSI EN 301 489-1 V2.2.3 (2019-11).

Declarations

BACL is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol "▲". Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

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SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

Test Mode: Operating

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

Software"Lantest.exe" and "Ping.exe" were used during test.

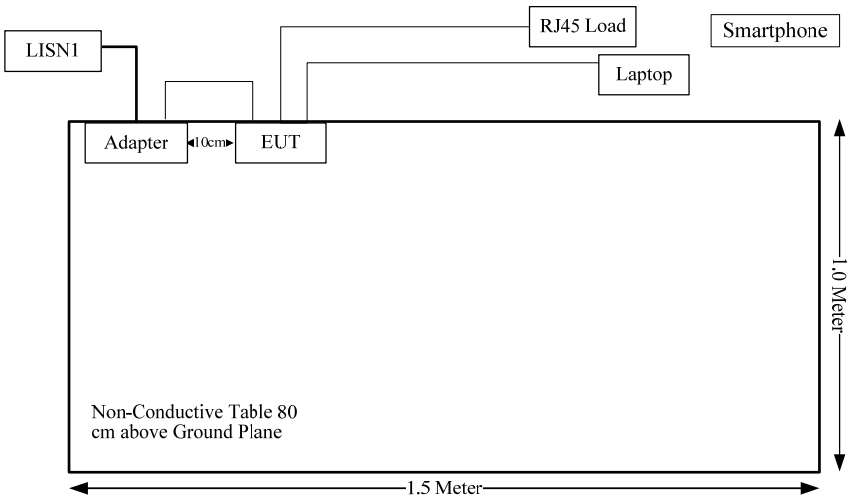
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	E6410	GYXJ3 A00 JSD2
Huawei	Phone	BLN-AL40	BLN-AL40C00B120
Bacl	RJ45 Load	RJ45X8	F-EM-PHRJ45X8002

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length(m)	From Port	To
Power Cable	No	No	1.5	EUT	Adapter
RJ45 Cable	Yes	No	10	EUT	Laptop/RJ45 Load

Block Diagram of Test Setup



Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted emission					
R&S	LISN	ENV 216	101614	2021-09-11	2022-09-10
TESEQ	ISN	T800	34379	2021-09-11	2022-09-10
R&S	EMI Test Receiver	ESCI	101121	2021-07-22	2022-07-21
MICRO-COAX	Coaxial Cable	C-NJNJ-50	C-0200-01	2021-09-05	2022-09-04
R&S	Test Software	EMC32	Version 9.10.00	N/A	N/A
Radiated emissions below 1GHz					
Sunol Sciences	Antenna	JB3	A060611-1	2020-11-10	2023-11-10
R&S	EMI Test Receiver	ESR3	102453	2021-09-22	2022-09-21
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2021-07-19	2022-07-18
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2021-07-19	2022-07-18
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2021-07-19	2022-07-18
Sonoma	Amplifier	310N	372193	2021-07-18	2022-07-17
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Radiated emissions above 1GHz					
ETS-Lindgren	Horn Antenna	3115	000 527 35	2021-10-12	2024-10-11
Agilent	Spectrum Analyzer	E4440A	SG43360054	2021-07-22	2022-07-21
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2021-09-04	2022-09-03
Mini-Circuit	Amplifier	ZVA-213-S+	54201245	2021-09-04	2022-09-03
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sinoscite	Bandstop Filters	BSF5150-5850MN-089 9-003	0899003	2021-05-06	2022-05-05
E-Microwave	Band-stop Filters	OBSF-2400-2483.5-S	OE01601525	2021-06-16	2022-06-15
EFT & Surge & Dips					
EM TEST	Ultra Compact Generator	UCS 500N5	P1406130994	2021-07-22	2022-07-21
EM TEST	Autotransformer	MV2616	P1450144859	N/A	N/A
EM TEST	CDN	CNV508 S1	311137	2022-01-26	2023-01-25
EM TEST	EFT Clamp	N/A	300886	2021-07-22	2022-07-21
ESD					
HAEFELY	Electrostatic Discharge Simulator	ONYX	180786	2021-10-27	2022-10-26
Flicker & Harmonic					
ELGAR	AC Power Source	1751SX	5611	2022-01-05	2023-01-05
EM TEST	Harmonic & Flicker Analyzer	DPA 500	303278	2021-10-27	2022-10-26
CS					
HP	Signal Generator	8648A	3246A00831	2021-09-11	2022-09-10
R&S	Power Amplifier	15A250	12934	N/A	N/A
Werlatone	Dual Directional Coupler	C5091-10	113192	2022-02-09	2023-02-08
HP	Power Meter	HP EPM-441A	GB37481494	2021-07-22	2022-07-21
Agilent	8482A Power sensor	8482A	US37296108	2021-07-22	2022-07-21
NARDA	Attenuator	769-6	2754	N/A	N/A
COM-POWER	CDN	M325E	521064	2021-07-22	2022-07-21
COM-POWER	CDN	T8E	581607	2021-07-22	2022-07-21
RS					
AR	Antenna	ATL80M1G	0351400	N/A	N/A
AR	Antenna	ATT700M12G	0349410	N/A	N/A

HP	Signal Generator	8665B	3438a00584	2021-07-22	2022-07-21
AR	Power Amplifier	500W1000C	0353561	N/A	N/A
AR	Power Amplifier	60S1G6	0348711	N/A	N/A
PASTERNACK	Dual Directional Coupler	PE2239-30	1711	2021-07-15	2022-07-14
Agilent	EPM Series Power Meter	E4419B	MY45103907	2021-07-22	2022-07-21
Agilent	E-Series Avg Power Sensor	E9301A	MY41497625	2021-07-22	2022-07-21
Agilent	E-Series Avg Power Sensor	E9301A	MY41497628	2021-07-22	2022-07-21

* Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Environmental Conditions

Test Item:	Conducted emission	Radiated emissions below 1GHz	Radiated emissions above 1GHz	EMS & Flicker*
Temperature:	22.3 °C	15.4°C	15.7°C	21.4~24.8°C
Relative Humidity:	66%	53%	58%	53~66 %
ATM Pressure:	100.9kPa	101.8kPa	102.2kPa	101.2 kPa
Tester:	Walker Chen	Leo Yuan	Bill Yang	April Wu
Test Date:	2022-03-07	2022-02-22	2022-02-24	2022-03-29

*Note: The **Relative Humidity** in ESD test site is 53%.

SUMMARY OF TEST RESULTS

SN	Rule and Clause	Description of Test	Test Result
1	EN 301 489 Clause 8.2	Enclosure of ancillary equipment measured on a stand alone basis	Compliant
2	EN 301 489 Clause 8.3	DC power input/output ports	Not applicable
3	EN 301 489 Clause 8.4	AC mains power input/output ports	Compliant
4	EN 301 489 Clause 8.5	Harmonic current emissions (AC mains input port)	Not applicable
5	EN 301 489 Clause 8.6	Voltage fluctuations and flicker (AC mains input port)	Compliant
6	EN 301 489 Clause 8.7	Wired network ports	Compliant
7	EN 301 489 Clause 9.2	Radio frequency electromagnetic fields (80 MHz to 6 000 MHz)	Compliant
8	EN 301 489 Clause 9.3	Electrostatic discharges	Compliant
9	EN 301 489 Clause 9.4	Fast transients, common mode	Compliant
10	EN 301 489 Clause 9.5	Radio frequency, common mode	Compliant
11	EN 301 489 Clause 9.6	Transients and surges in the vehicular environment	Not applicable
12	EN 301 489 Clause 9.7	Voltage dips and short interruptions	Compliant
13	EN 301 489 Clause 9.8	Surges	Compliant

Note:
Not Applicable: Please refer to Applicability overview tables in sections 7.1 and 7.2 of EN 301 489-1 requirements for Radio and ancillary equipment.

1 – ENCLOSURE OF ANCILLARY EQUIPMENT MEASURED ON A STAND ALONE BASIS

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
– compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
– non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 1, then:
– compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
– non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

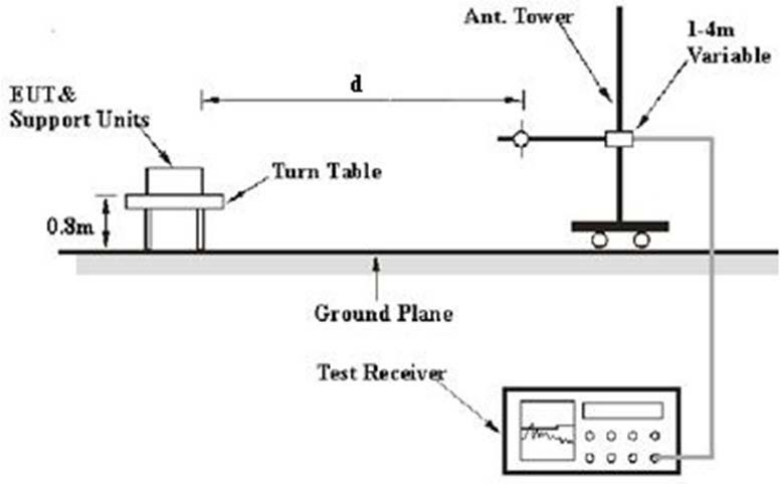
Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 10m at Bay Area Compliance Laboratories Corp. (Dongguan) is:30M~200MHz: 4.55 dB for Horizontal, 4.57 dB for Vertical; 200M~1GHz: 4.66 dB for Horizontal, 4.56 dB for Vertical; measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical; 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical; 1G~6GHz: 4.45 dB, 6G~18GHz: 5.23 dB.

Table 1 – Values of U_{cispr}

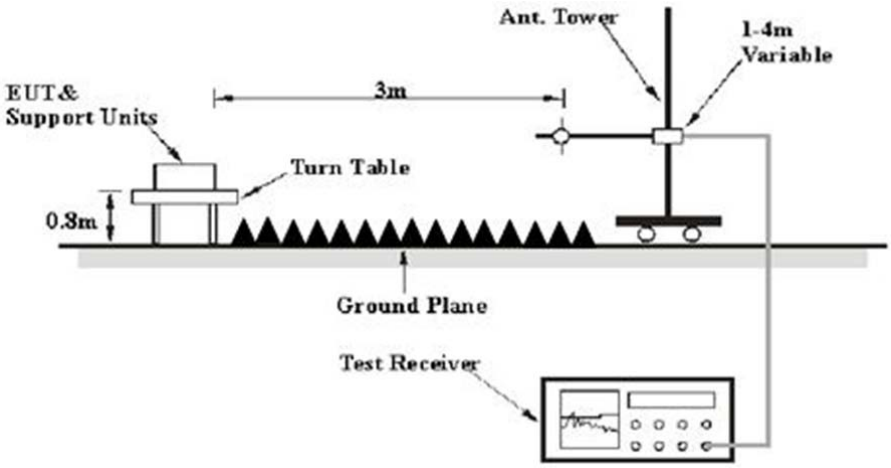
Measurement		U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC)	(30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR)	(1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR)	(6 GHz to 18 GHz)	5.5 dB

Test System Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests below 1GHz were performed in 3 meters, above 1GHz were performed in the 3 meters. The specification used was EN 55032 Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 6 GHz.

During the radiated emission test, the EMI test receiver Setup was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	Peak
	1MHz	10Hz	/	Average

If the maximized peak measured value complies with under the QP/Average limit more than 6dB, then it is unnecessary to perform an QP/Average measurement.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

If the maximized peak measured value complies with under the QP limit more than 6dB, then it is unnecessary t o perform an QP measurement.

Corrected Amplitude & Margin Calculation

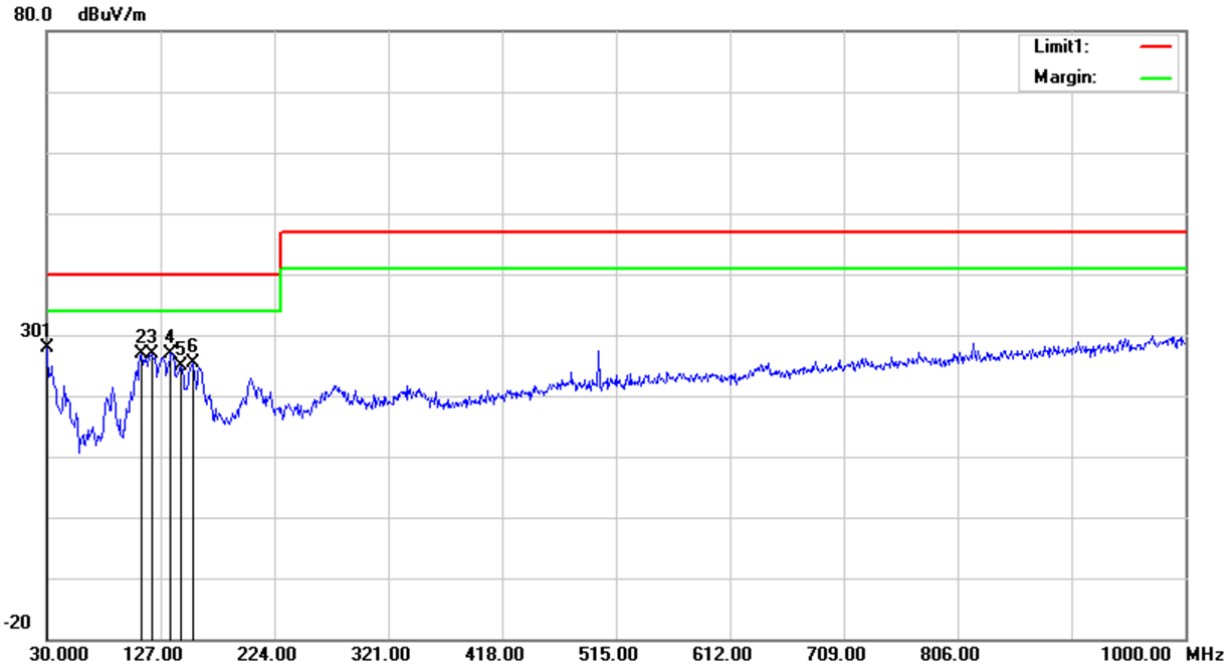
The basic equation is as follows: Result = Meter Reading+ Corrected
Note:
Corrected = Antenna Factor + Cable Loss - Amplifier Gain, or;
Corrected = Antenna Factor + Cable Loss + Insertion loss of attenuator - Amplifier Gain
The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows: Margin = Result-Limit

Test Data

Please refer to following table and plots:

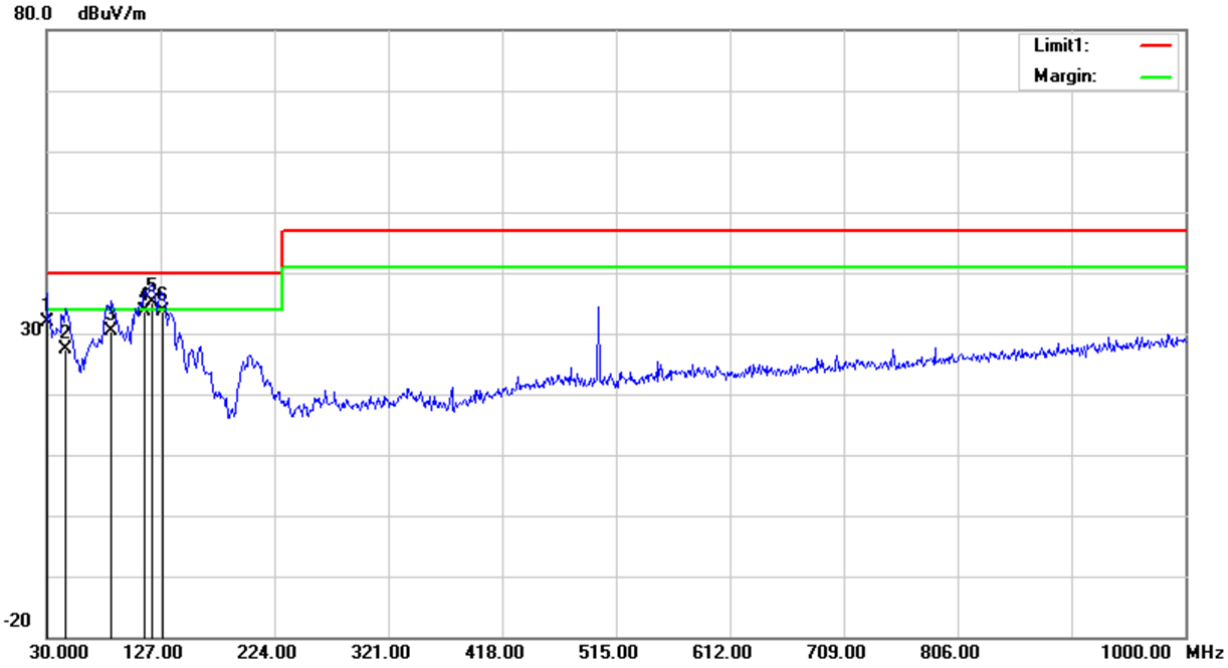
Below 1G

Condition:	**EN 301 489 Class B 3m Radiation**	**Polarization:**	**Horizontal**
EUT:	AX3000 Whole Home Mesh Wi-Fi 6 System	**Power:**	**AC 110V/60Hz**
Model:	**Mesh12X**	**Distance:**	3m
Test Mode:	**Operating**		



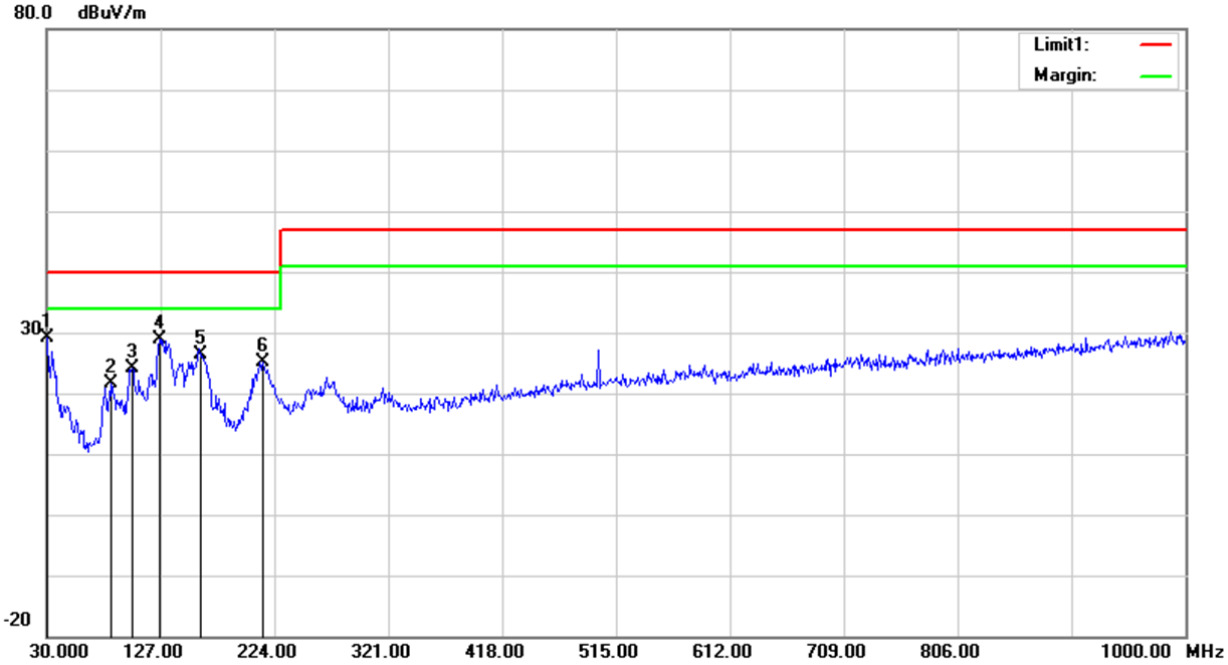
No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	30.0000	31.27	peak	-3.49	27.78	40.00	12.22
2	110.5100	38.72	peak	-11.92	26.80	40.00	13.20
3	119.2400	37.64	peak	-10.65	26.99	40.00	13.01
4	135.7300	38.24	peak	-11.24	27.00	40.00	13.00
5	144.4600	36.88	peak	-12.01	24.87	40.00	15.13
6	154.1600	37.22	peak	-11.95	25.27	40.00	14.73

Condition:	**EN 301 489 Class B 3m Radiation**	**Polarization:**	**Vertical**
EUT:	AX3000 Whole Home Mesh Wi-Fi 6 System	**Power:**	**AC 110V/60Hz**
Model:	**Mesh12X**	**Distance:**	3m
Test Mode:	**Operating**		



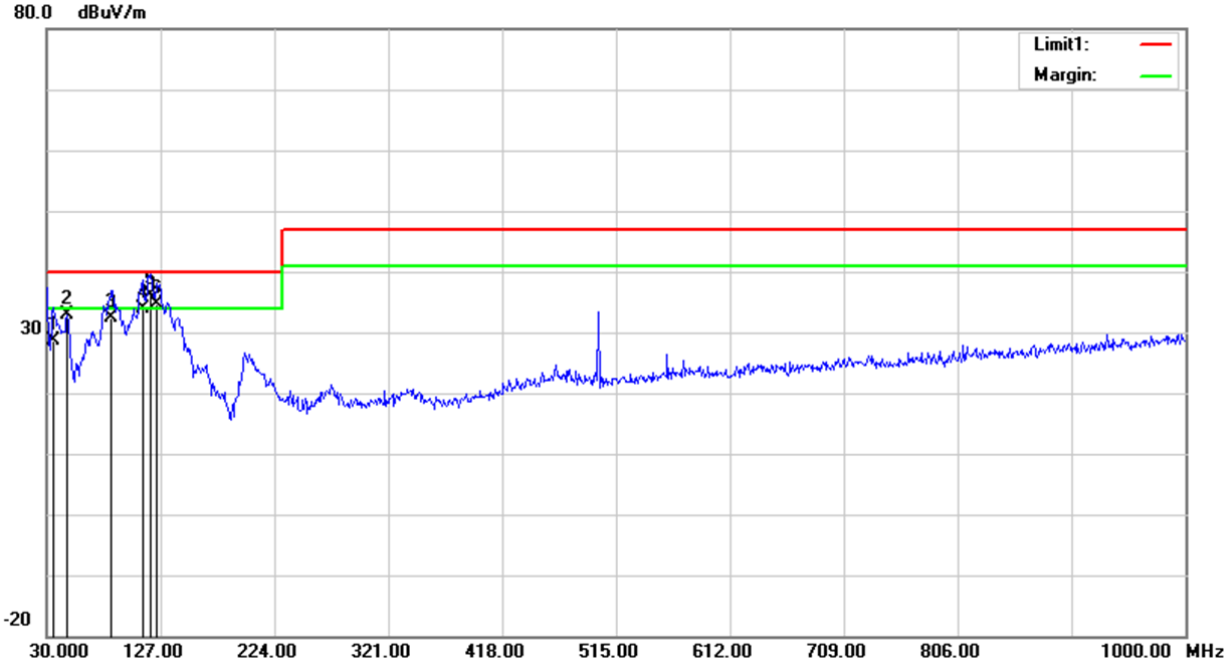
No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	30.0000	35.40	QP	-3.49	31.91	40.00	8.09
2	45.5200	42.10	QP	-14.70	27.40	40.00	12.60
3	85.2900	47.40	QP	-17.03	30.37	40.00	9.63
4	113.4200	44.80	QP	-11.26	33.54	40.00	6.46
5	119.2400	45.80	QP	-10.65	35.15	40.00	4.85
6	128.9400	44.30	QP	-10.72	33.58	40.00	6.42

Condition:	**EN 301 489 Class B 3m Radiation**	**Polarization:**	**Horizontal**
EUT:	AX3000 Whole Home Mesh Wi-Fi 6 System	**Power:**	**AC 230V/50Hz**
Model:	**Mesh12X**	**Distance:**	3m
Test Mode:	**Operating**		



No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	30.0000	32.65	peak	-3.49	29.16	40.00	10.84
2	85.2900	38.55	peak	-17.03	21.52	40.00	18.48
3	102.7500	37.75	peak	-13.74	24.01	40.00	15.99
4	126.0300	39.57	peak	-10.58	28.99	40.00	11.01
5	160.9500	38.39	peak	-12.09	26.30	40.00	13.70
6	214.3000	38.84	peak	-13.78	25.06	40.00	14.94

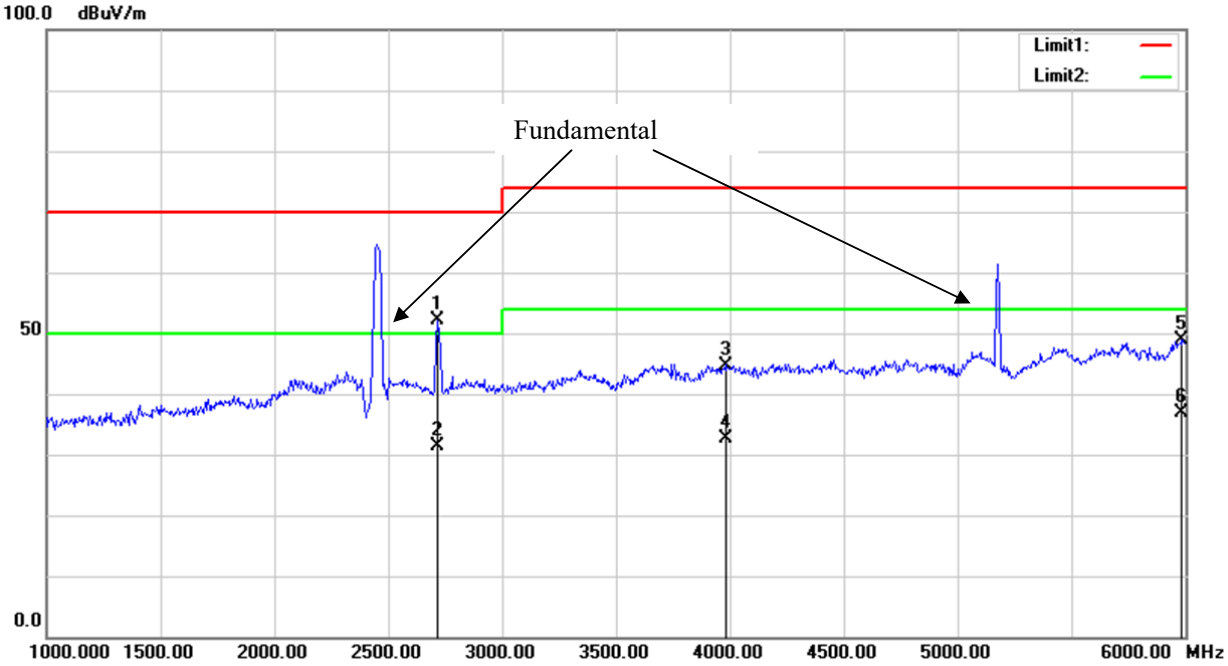
Condition:	**EN 301 489 Class B 3m Radiation**	**Polarization:**	**Vertical**
EUT:	AX3000 Whole Home Mesh Wi-Fi 6 System	**Power:**	**AC 230V/50Hz**
Model:	**Mesh12X**	**Distance:**	3m
Test Mode:	**Operating**		



No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	35.8200	36.30	QP	-7.76	28.54	40.00	11.46
2	47.4600	48.61	peak	-15.66	32.95	40.00	7.05
3	85.2900	49.30	QP	-17.03	32.27	40.00	7.73
4	111.4800	45.60	QP	-11.71	33.89	40.00	6.11
5	118.2700	46.70	QP	-10.63	36.07	40.00	3.93
6	124.0900	45.00	QP	-10.46	34.54	40.00	5.46

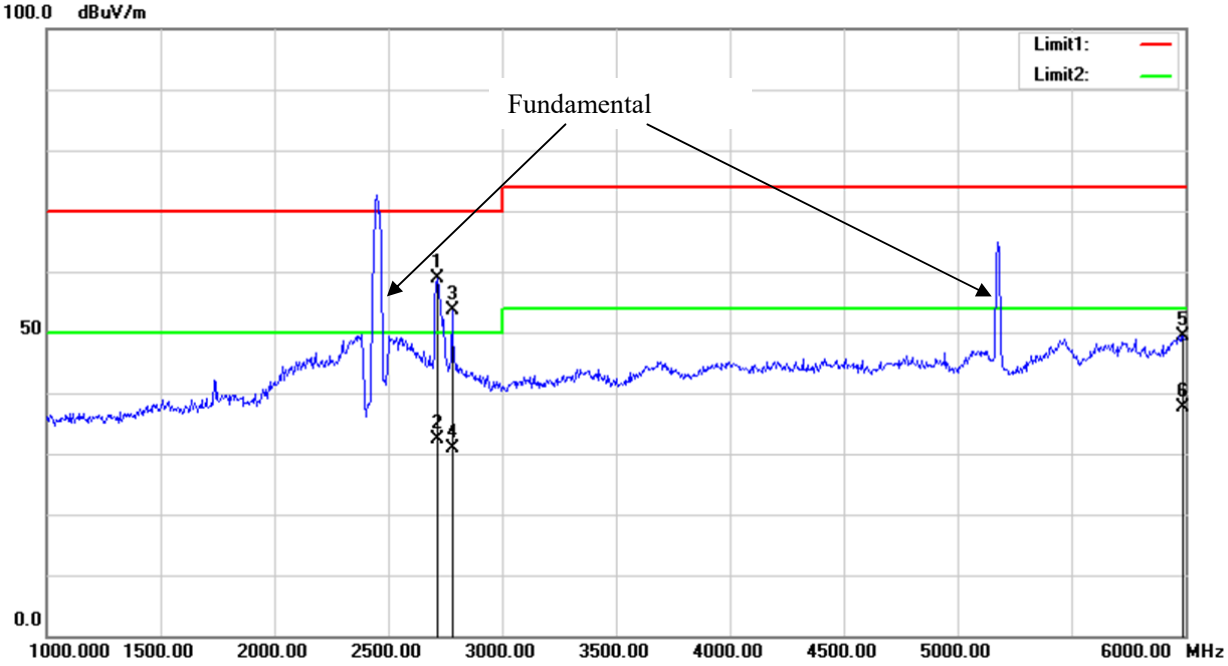
Above 1G

Condition:	**EN 301 489 Class B**	**Polarization:**	**Horizontal**
EUT:	AX3000 Whole Home Mesh Wi-Fi 6 System	**Power:**	**AC 110V/60Hz**
Model:	**Mesh12X**	**Distance:**	3m
Test Mode:	**Operating**		



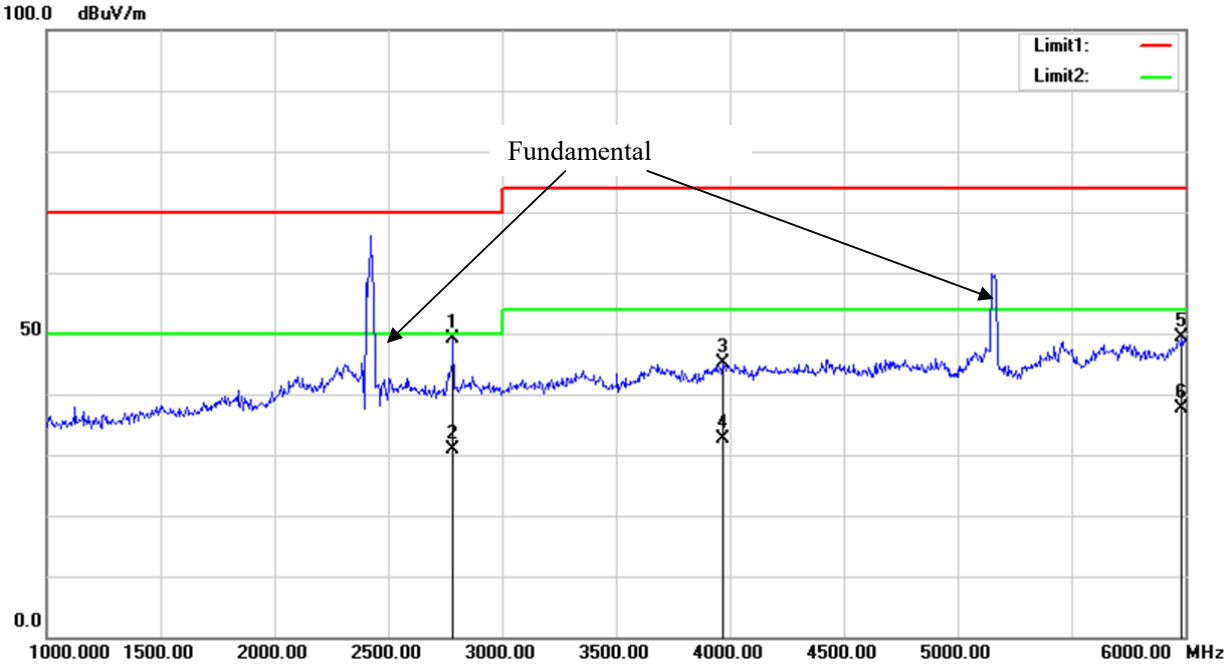
No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	2717.500	47.27	peak	4.85	52.12	70.00	17.88
2	2717.500	26.54	AVG	4.85	31.39	50.00	18.61
3	3982.500	35.65	peak	9.10	44.75	74.00	29.25
4	3982.500	23.57	AVG	9.10	32.67	54.00	21.33
5	5985.000	34.92	peak	14.00	48.92	74.00	25.08
6	5985.000	22.84	AVG	14.00	36.84	54.00	17.16

Condition:	**EN 301 489 Class B**	**Polarization:**	**Vertical**
EUT:	AX3000 Whole Home Mesh Wi-Fi 6 System	**Power:**	**AC 110V/60Hz**
Model:	**Mesh12X**	**Distance:**	3m
Test Mode:	**Operating**		



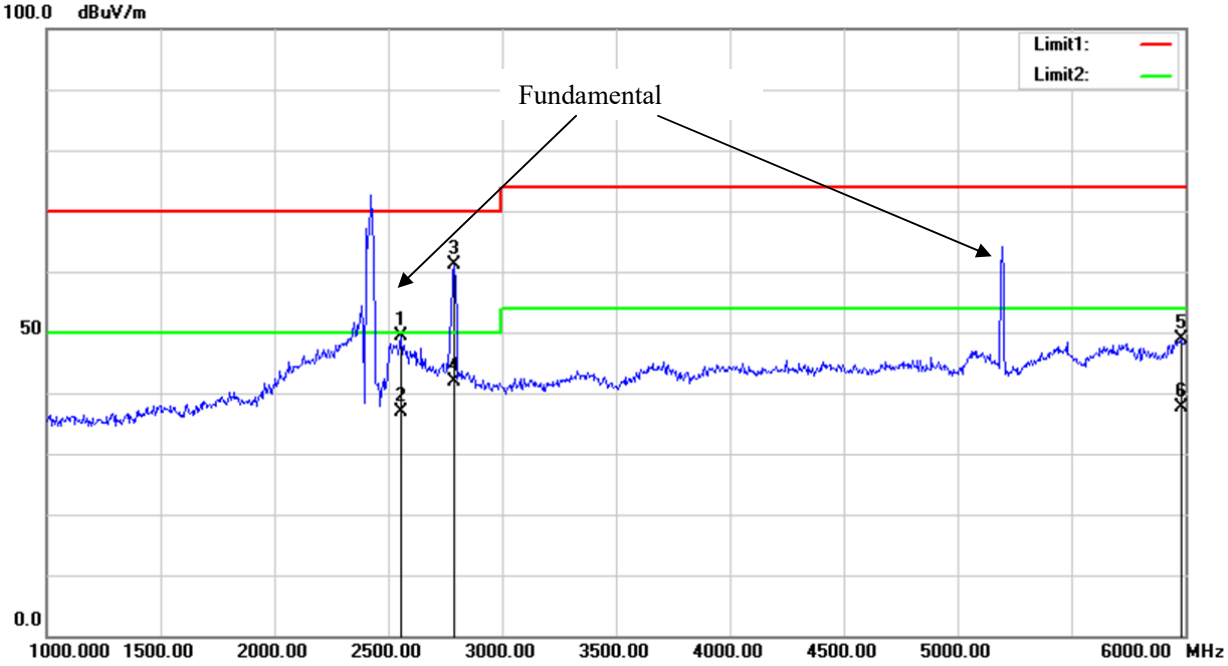
No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	2717.500	53.99	peak	4.85	58.84	70.00	11.16
2	2717.500	27.51	AVG	4.85	32.36	50.00	17.64
3	2782.500	48.37	peak	5.17	53.54	70.00	16.46
4	2782.500	25.68	AVG	5.17	30.85	50.00	19.15
5	5992.500	35.32	peak	14.04	49.36	74.00	24.64
6	5992.500	23.61	AVG	14.04	37.65	54.00	16.35

Condition:	**EN 301 489 Class B**	**Polarization:**	**Horizontal**
EUT:	AX3000 Whole Home Mesh Wi-Fi 6 System	**Power:**	**AC 230V/50Hz**
Model:	**Mesh12X**	**Distance:**	3m
Test Mode:	**Operating**		



No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	2785.000	43.97	peak	5.18	49.15	70.00	20.85
2	2785.000	25.68	AVG	5.18	30.86	50.00	19.14
3	3970.000	35.93	peak	9.08	45.01	74.00	28.99
4	3970.000	23.64	AVG	9.08	32.72	54.00	21.28
5	5987.500	35.37	peak	14.02	49.39	74.00	24.61
6	5987.500	23.67	AVG	14.02	37.69	54.00	16.31

Condition:	**EN 301 489 Class B**	**Polarization:**	**Vertical**
EUT:	AX3000 Whole Home Mesh Wi-Fi 6 System	**Power:**	**AC 230V/50Hz**
Model:	**Mesh12X**	**Distance:**	3m
Test Mode:	**Operating**		



No.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1	2555.000	45.18	peak	4.14	49.32	70.00	20.68
2	2555.000	32.69	AVG	4.14	36.83	50.00	13.17
3	2792.500	55.98	peak	5.20	61.18	70.00	8.82
4	2792.500	36.57	AVG	5.20	41.77	50.00	8.23
5	5982.500	34.81	peak	13.99	48.80	74.00	25.20
6	5982.500	23.64	AVG	13.99	37.63	54.00	16.37

2 – DC POWER INPUT/OUTPUT PORTS

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

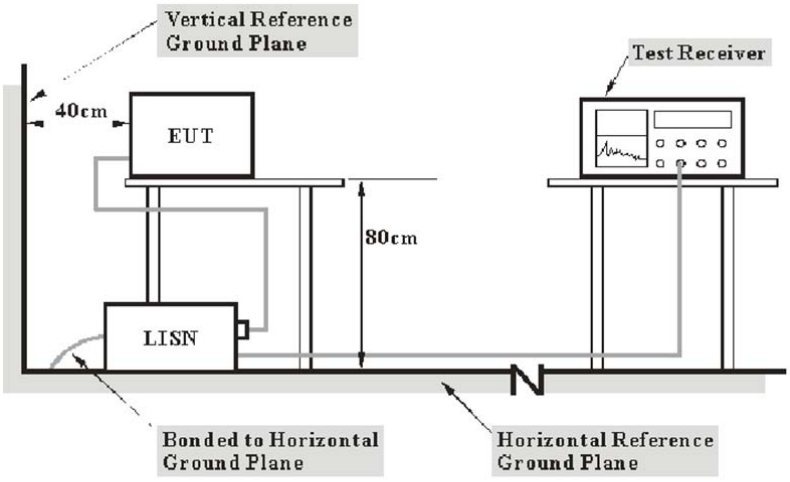
If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

Based on CISPR 16-4-2-2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Dongguan) is 3.12 dB (150 kHz to 30 MHz), and conducted disturbance at telecommunication port using AAN is 5.0 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cispr}

Measurement	U_{cispr}
Conducted disturbance at mains port using AMN (9 kHz to 150 kHz)	3.8 dB
(150 kHz to 30 MHz)	3.4 dB
Conducted disturbance at mains port using voltage probe (9 kHz to 30 MHz)	2.9 dB
Conducted disturbance at telecommunication port using AAN (150 kHz to 30 MHz)	5.0 dB
Conducted disturbance at telecommunication port using CVP (150 kHz to 30 MHz)	3.9 dB
Conducted disturbance at telecommunication port using CP (150 kHz to 30 MHz)	2.9 dB

Test System Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per EN 301 489-1 measurement procedures. The specification used was with the EN 301 489-1 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emissions test, the adapter was connected to the main outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Except for the recorded frequency points (no more than 6), the remaining frequency points have a margin more than 20dB.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

Result (QuasiPeak or Average) = Meter Reading + Corr.

Note:
Corr. = Cable loss + Factor of coupling device

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

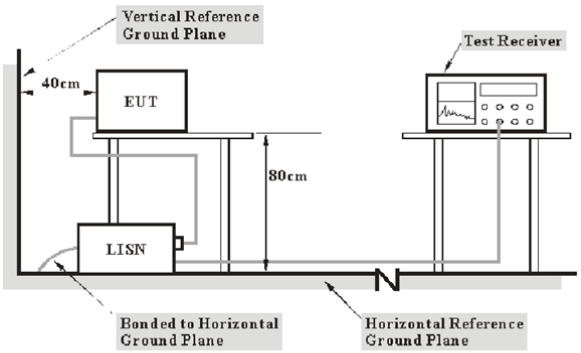
Margin = Limit – Result

Test Data

Not Applicable: Please refer to Applicability overview tables in sections 7.1 and 7.2 of EN 301 489-1 requirements for Radio and ancillary equipment.

3 - AC MAINS POWER INPUT/OUTPUT PORTS

Test System Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per EN 301 489-1 measurement procedures. The specification used was with the EN 301 489-1 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter was connected to AC230V/50Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emissions test, the adapter was connected to the main outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows: Result (QuasiPeak or Average) = Meter Reading + Corr.

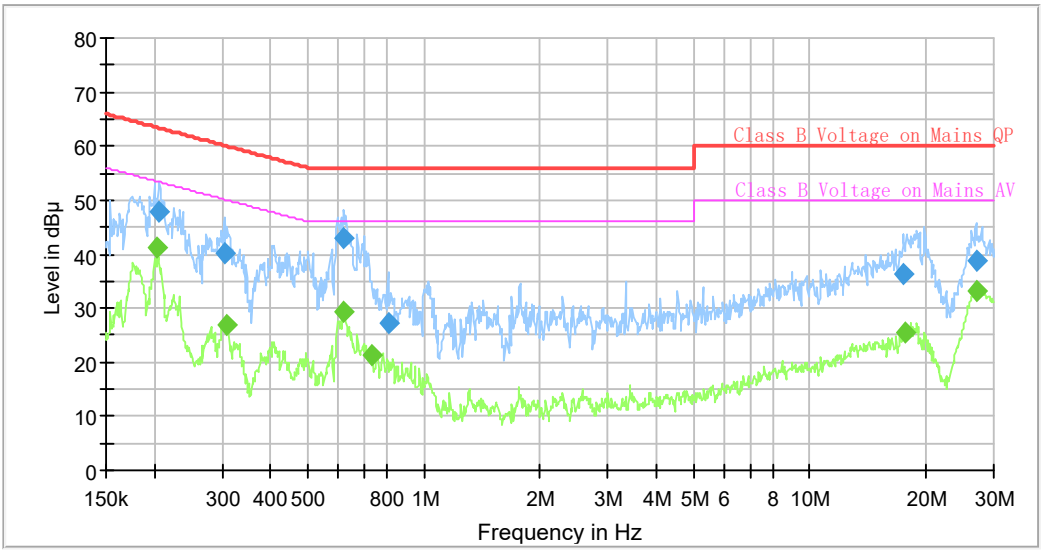
Note:
Corr. = Cable loss + Factor of coupling device

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows: Margin = Limit – Result

Test Data

Please refer to following table and plots:

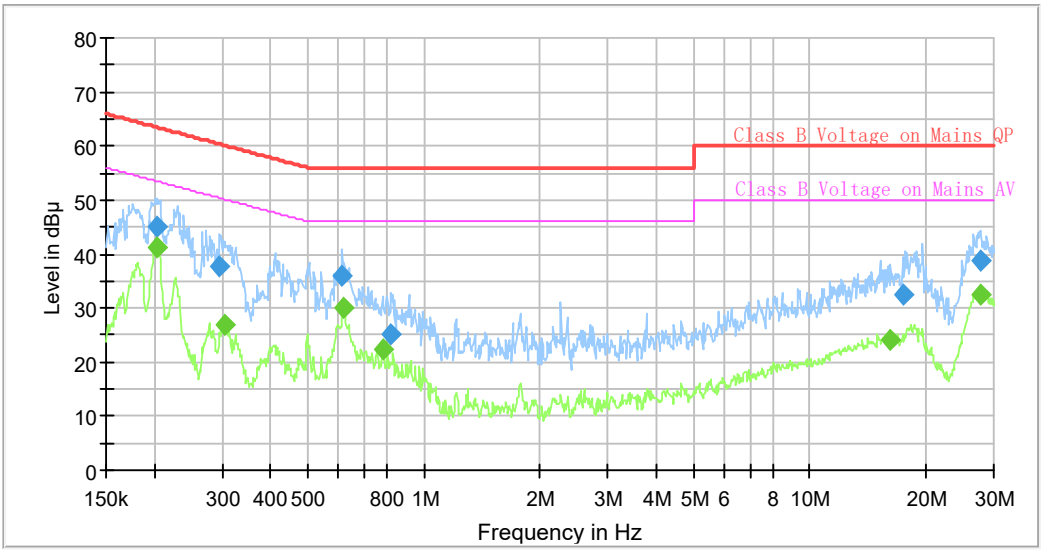
Port:	L
Test Mode:	Operating
Power Source:	AC 110V/60Hz
Note:	



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.202328	---	41.33	53.51	12.18	9.000	L1	9.6
0.206405	47.77	---	63.35	15.58	9.000	L1	9.6
0.303044	40.15	---	60.16	20.01	9.000	L1	9.6
0.309151	---	26.76	49.99	23.23	9.000	L1	9.6
0.621468	42.86	---	56.00	13.14	9.000	L1	9.6
0.621468	---	29.51	46.00	16.49	9.000	L1	9.6
0.736317	---	21.27	46.00	24.73	9.000	L1	9.7
0.809506	27.25	---	56.00	28.75	9.000	L1	9.7
17.478903	36.44	---	60.00	23.56	9.000	L1	10.1
17.654129	---	25.40	50.00	24.60	9.000	L1	10.1
26.975006	38.92	---	60.00	21.08	9.000	L1	10.1
27.245430	---	33.24	50.00	16.76	9.000	L1	10.1

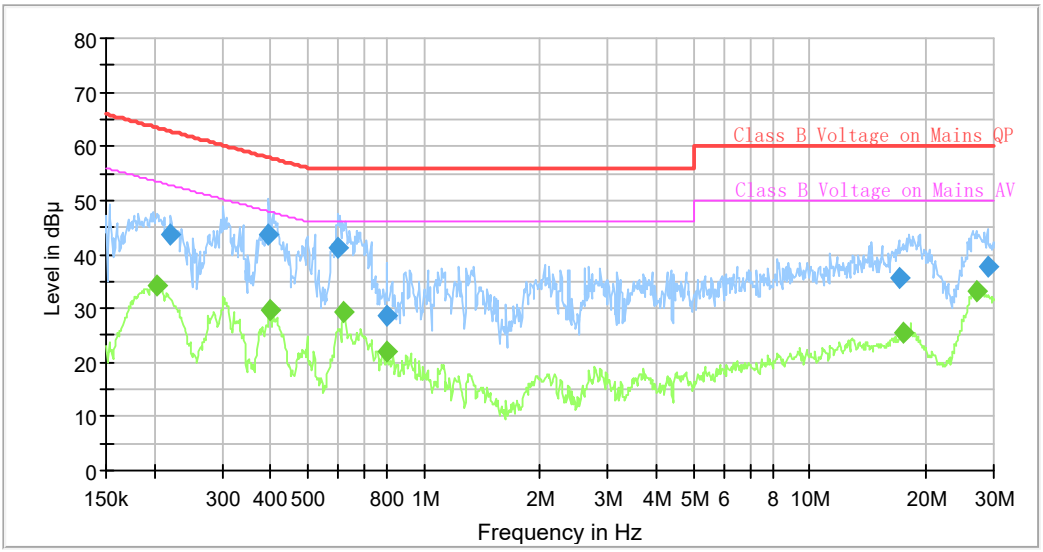
Port: N
Test Mode: Operating
Power Source: AC 110V/60Hz
Note:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.204356	---	41.13	53.43	12.30	9.000	N	9.6
0.204356	45.24	---	63.43	18.19	9.000	N	9.6
0.295580	37.67	---	60.37	22.70	9.000	N	9.6
0.306082	---	26.75	50.08	23.33	9.000	N	9.6
0.615300	35.81	---	56.00	20.19	9.000	N	9.6
0.621468	---	30.18	46.00	15.82	9.000	N	9.6
0.781732	---	22.45	46.00	23.55	9.000	N	9.6
0.821710	25.03	---	56.00	30.97	9.000	N	9.6
16.218969	---	24.22	50.00	25.78	9.000	N	9.9
17.391943	32.34	---	60.00	27.66	9.000	N	9.9
27.656159	---	32.49	50.00	17.51	9.000	N	9.9
27.656159	38.79	---	60.00	21.21	9.000	N	9.9

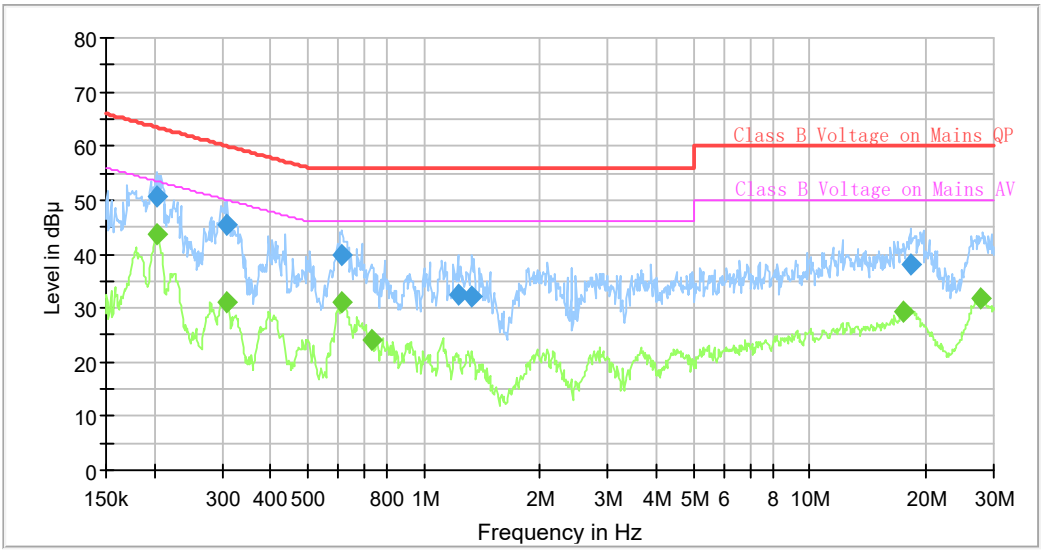
Port: L
Test Mode: Operating
Power Source: AC 230V/50Hz
Note:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.204356	---	34.11	53.43	19.32	9.000	L1	9.6
0.220231	43.78	---	62.81	19.03	9.000	L1	9.6
0.396710	43.77	---	57.92	14.15	9.000	L1	9.6
0.398694	---	29.63	47.88	18.25	9.000	L1	9.6
0.600145	41.32	---	56.00	14.68	9.000	L1	9.6
0.621468	---	29.39	46.00	16.61	9.000	L1	9.6
0.801471	28.77	---	56.00	27.23	9.000	L1	9.7
0.805479	---	22.11	46.00	23.89	9.000	L1	9.7
17.048409	35.72	---	60.00	24.28	9.000	L1	10.1
17.391943	---	25.35	50.00	24.65	9.000	L1	10.1
26.975006	---	33.21	50.00	16.79	9.000	L1	10.1
28.925869	37.86	---	60.00	22.14	9.000	L1	10.1

Port: N
Test Mode: Operating
Power Source: AC 230V/50Hz
Note:

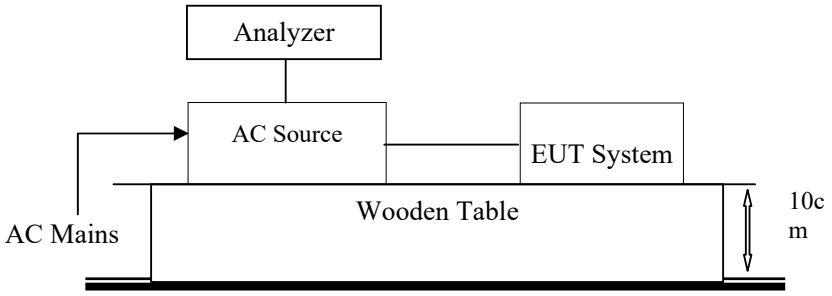


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.202328	---	43.59	53.51	9.92	9.000	N	9.6
0.202328	50.58	---	63.51	12.93	9.000	N	9.6
0.309151	---	31.17	49.99	18.82	9.000	N	9.6
0.309151	45.30	---	59.99	14.69	9.000	N	9.6
0.612239	40.00	---	56.00	16.00	9.000	N	9.6
0.615300	---	31.15	46.00	14.85	9.000	N	9.6
0.736317	---	23.97	46.00	22.03	9.000	N	9.6
1.224625	32.54	---	56.00	23.46	9.000	N	9.6
1.332988	32.12	---	56.00	23.88	9.000	N	9.6
17.566298	---	29.42	50.00	20.58	9.000	N	9.9
18.281370	38.05	---	60.00	21.95	9.000	N	9.9
27.656159	---	31.71	50.00	18.29	9.000	N	9.9

4 - HARMONIC CURRENT EMISSIONS (AC MAINS INPUT PORT)

Test System Setup



Test Standard

EN 61000-3-2:2019

Test product class

Class A: - Balanced three-phase equipment
- Household appliances excluding equipment identified as class D
- Tools excluding portable tools
- Dimmers for incandescent lamps
- Audio equipment

Class B: - Portable tools
- Arc welding equipment, which is not professional equipment

Class C: - Lighting equipment

Class D: Equipment having a specified power less than or equal to 600w, of the following type:
- Personal computer and personal computer monitors
- Television receivers

Table 1 – Limits for Class A equipment

Harmonic order n	Maximum permissible harmonic current A
Odd harmonics	
3	2,30
5	1,14
7	0,77
9	0,40
11	0,33
13	0,21
$15 \le n \le 39$	$0,15 \frac{15}{n}$
Even harmonics	
2	1,08
4	0,43
6	0,30
$8 \le n \le 40$	$0,23 \frac{8}{n}$

Table 2 – Limits for Class C equipment

Harmonic order n	Maximum permissible harmonic currrent expressed as a percentage of the input current at the fundamental frequency %
2	2
3	$30 \cdot \lambda$ *
5	10
7	7
9	5
$11 \le n \le 39$ (odd harmonics only)	3
* λ is the circuit power factor	

Table 3 – Limits for Class D equipment

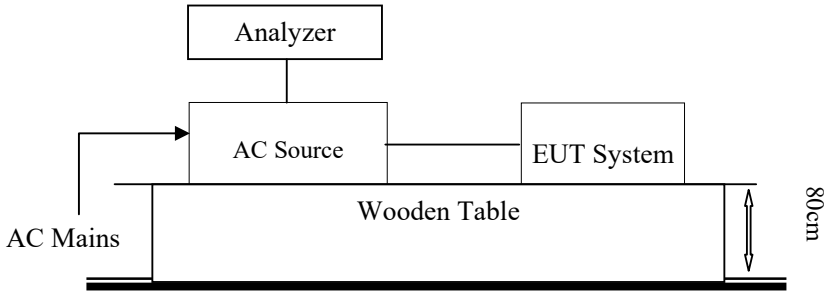
Harmonic order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3	3,4	2,30
5	1,9	1,14
7	1,0	0,77
9	0,5	0,40
11	0,35	0,33
$13 \le n \le 39$ (odd harmonics only)	$\frac{3,85}{n}$	See Table 1

Test Data

Not Applicable: Please refer to Applicability overview tables in sections 7.1 and 7.2 of EN 301 489-1 requirements for Radio and ancillary equipment.

5 - VOLTAGE FLUCTUATIONS AND FLICKER (AC MAINS INPUT PORT)

Test System Setup



Test Standard

EN 61000-3-3:2013/A1:2019

Flicker Test Limits:

The limits shall be applicable to voltage fluctuations and flicker at the supply terminals of the equipment under test, measured or calculated according to clause 4 under test conditions described in clause 6 and annex A. Tests made to prove compliance with the limits are considered to be type tests.
The following limits apply:
– the value of Pst shall not be greater than 1,0;
– the value of Plt shall not be greater than 0,65;
– the value of d(t) during a voltage change shall not exceed 3,3 % for more than 500 ms;
– the relative steady-state voltage change, dc, shall not exceed 3,3 %;
– the maximum relative voltage change dmax, shall not exceed
a) 4 % without additional conditions;
b) 6 % for equipment which is:
– switched manually, or
– switched automatically more frequently than twice per day, and also has either adelayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.
Note: The cycling frequency will be further limited by the Pst and Plt limit. For example: a dmax of 6 % producing a rectangular voltage change characteristic twice per hour will give a Plt of about 0,65.
c) 7 % for equipment which is
– attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
– switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.

In the case of equipment having several separately controlled circuits in accordance with 6.6,limits b) and c) shall apply only if there is delayed or manual restart after a power supply interruption; for all equipment with automatic switching which is energized immediately on restoration of supply after a power supply interruption, limits a) shall apply; for all equipment with manual switching, limits b) or c) shall apply depending on the rate of switching. Pst and Plt requirements shall not be applied to voltage changes caused by manual switching. The limits shall not be applied to voltage changes associated with emergency switching or emergency interruptions.

Test Data

Please refer to following tables:

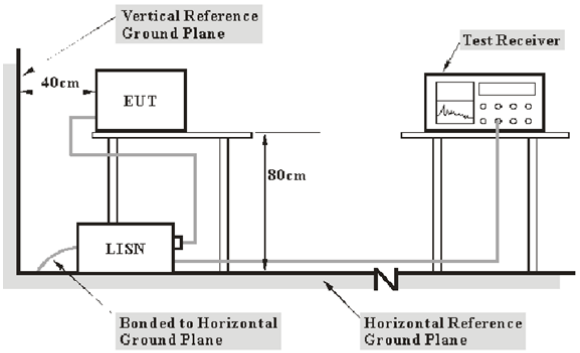
Short time (Pst):	10 min
Observation time:	120 min (12 Flicker measurement)
Test Mode:	Operating
Power Source:	AC 230V/50Hz
Test Result	PASS

Maximum Flicker results:

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.005	3.30	PASS
dmax [%]	0.365	4.00	PASS
dt [s]	0.000	0.50	PASS

6 - WIRED NETWORK PORTS

Test System Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per EN 301 489-1 measurement procedures. The specification used was with the EN 301 489-1 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

If the QP/Average value complies with the limit more than 10dB, then they were not recorded.

Test Procedure

During the conducted emissions test, the EUT was connected to the main outlet of the first LISN and the other support equipments were connected to the outlet of the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

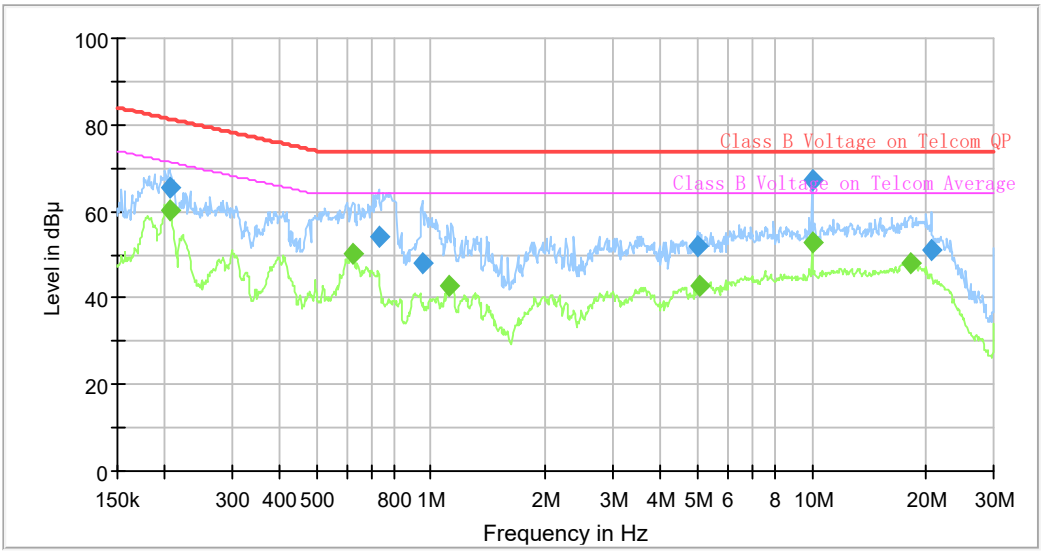
Corrected Amplitude & Margin Calculation

The basic equation is as follows:
Result (QuasiPeak or Average) = Meter Reading + Corr.
Note:
Corr. = Cable loss + Factor of coupling device
The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:
Margin = Limit – Result

Test Data

Please refer to following table and plots :

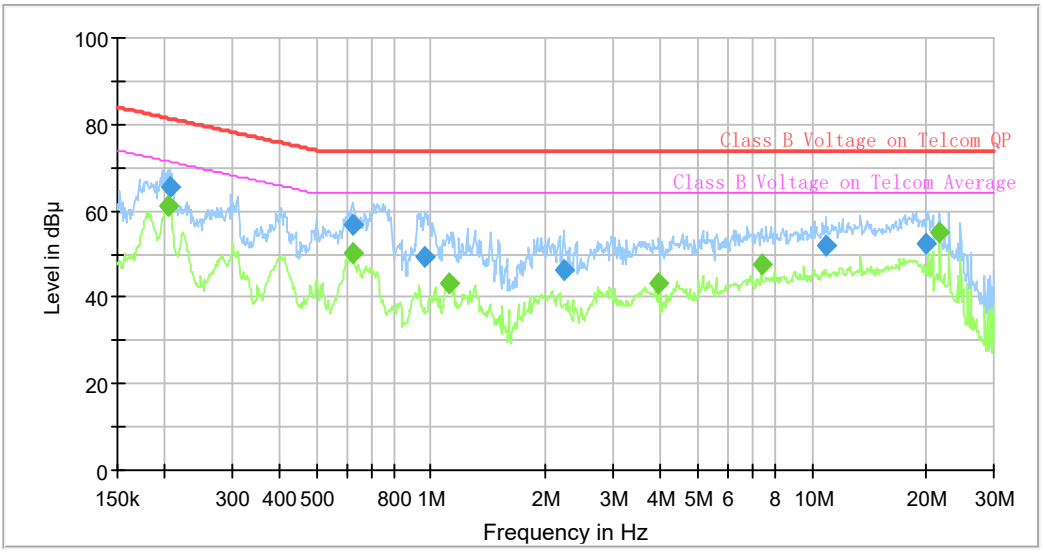
Port:	LAN
Test Mode:	10Mbps
Power Source:	AC 230V/50Hz
Note:	



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line
0.205378	---	60.22	71.39	11.17	9.000	Line 1
0.205378	65.31	---	81.39	16.08	9.000	Line 1
0.621468	---	50.20	64.00	13.80	9.000	Line 1
0.729009	54.21	---	74.00	19.79	9.000	Line 1
0.949586	48.06	---	74.00	25.94	9.000	Line 1
1.108363	---	42.93	64.00	21.07	9.000	Line 1
4.998419	52.04	---	74.00	21.96	9.000	Line 1
5.073771	---	42.64	64.00	21.36	9.000	Line 1
9.998049	67.45	---	74.00	6.55	9.000	Line 1
9.998049	---	53.00	64.00	11.00	9.000	Line 1
18.099918	---	48.22	64.00	15.78	9.000	Line 1
20.606025	51.08	---	74.00	22.92	9.000	Line 1

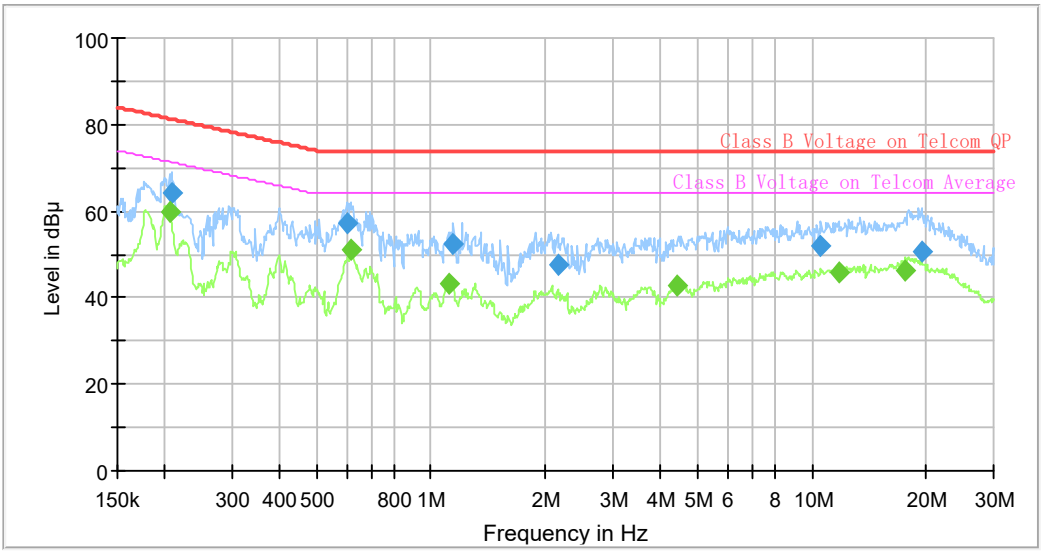
Port: LAN
Test Mode: 100Mbps
Power Source: AC 230V/50Hz
Note:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.203339	---	60.96	71.47	10.51	9.000	Line 1	10.0
0.205378	65.44	---	81.39	15.95	9.000	Line 1	10.0
0.621468	---	50.33	64.00	13.67	9.000	Line 1	9.8
0.621468	56.80	---	74.00	17.20	9.000	Line 1	9.8
0.963901	49.48	---	74.00	24.52	9.000	Line 1	9.7
1.113905	---	43.38	64.00	20.62	9.000	Line 1	9.7
2.228079	46.34	---	74.00	27.66	9.000	Line 1	9.6
3.953919	---	43.42	64.00	20.58	9.000	Line 1	9.6
7.375399	---	47.55	64.00	16.45	9.000	Line 1	9.6
10.882741	51.80	---	74.00	22.20	9.000	Line 1	9.6
19.899024	52.31	---	74.00	21.69	9.000	Line 1	9.7
21.659819	---	54.83	64.00	9.17	9.000	Line 1	9.7

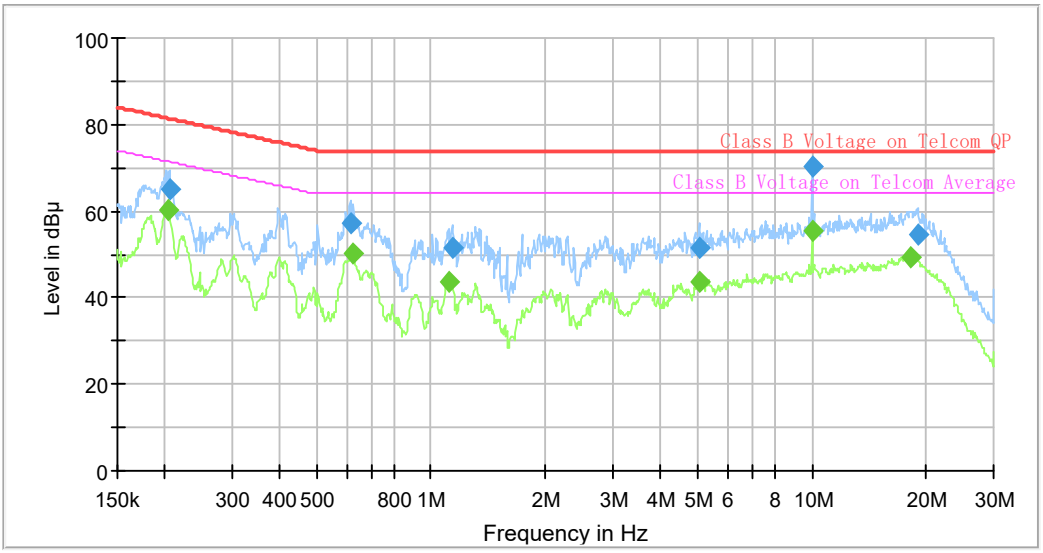
Port: LAN
Test Mode: 1000Mbps
Power Source: AC 230V/50Hz
Note:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.205378	---	59.95	71.39	11.44	9.000	Line 1	10.0
0.208474	64.28	---	81.27	16.99	9.000	Line 1	10.0
0.600145	57.08	---	74.00	16.92	9.000	Line 1	9.8
0.618376	---	51.11	64.00	12.89	9.000	Line 1	9.8
1.113905	---	43.27	64.00	20.73	9.000	Line 1	9.7
1.142032	52.28	---	74.00	21.72	9.000	Line 1	9.7
2.151633	47.52	---	74.00	26.48	9.000	Line 1	9.6
4.434526	---	42.73	64.00	21.27	9.000	Line 1	9.6
10.561897	52.07	---	74.00	21.93	9.000	Line 1	9.6
11.728143	---	45.82	64.00	18.18	9.000	Line 1	9.6
17.654129	---	46.21	64.00	17.79	9.000	Line 1	9.6
19.408925	50.52	---	74.00	23.48	9.000	Line 1	9.7

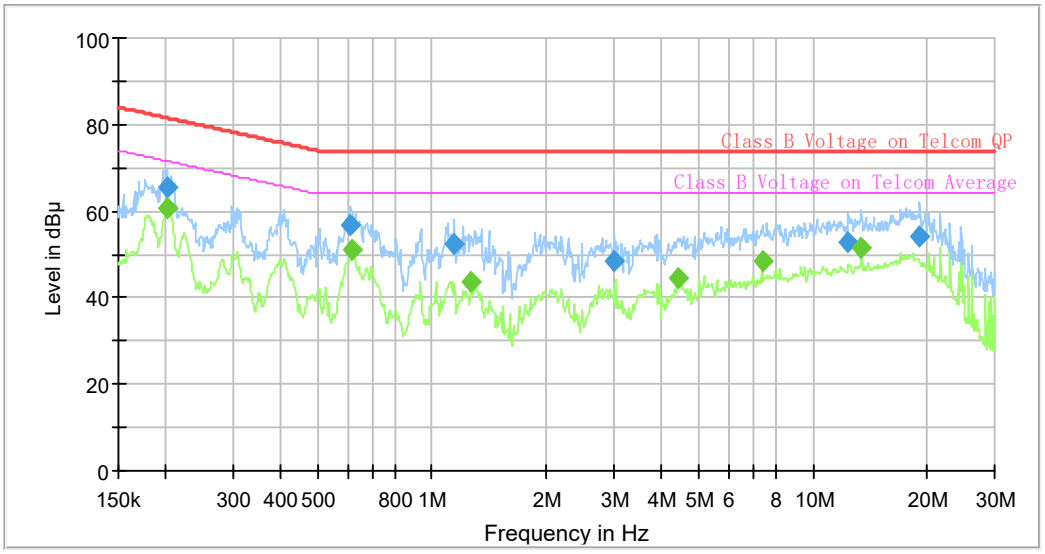
Port:	WAN
Test Mode:	10Mbps
Power Source:	AC 230V/50Hz
Note:	



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.204356	---	60.48	71.43	10.95	9.000	Line 1	10.0
0.205378	65.08	---	81.39	16.31	9.000	Line 1	10.0
0.615300	57.29	---	74.00	16.71	9.000	Line 1	9.8
0.621468	---	50.24	64.00	13.76	9.000	Line 1	9.8
1.113905	---	43.68	64.00	20.32	9.000	Line 1	9.7
1.136351	51.52	---	74.00	22.48	9.000	Line 1	9.7
5.048528	51.66	---	74.00	22.34	9.000	Line 1	9.6
5.073771	---	43.62	64.00	20.38	9.000	Line 1	9.6
9.998049	70.20	---	74.00	3.80	9.000	Line 1	9.6
9.998049	---	55.49	64.00	8.51	9.000	Line 1	9.6
18.190418	---	49.48	64.00	14.52	9.000	Line 1	9.7
18.930896	54.70	---	74.00	19.30	9.000	Line 1	9.7

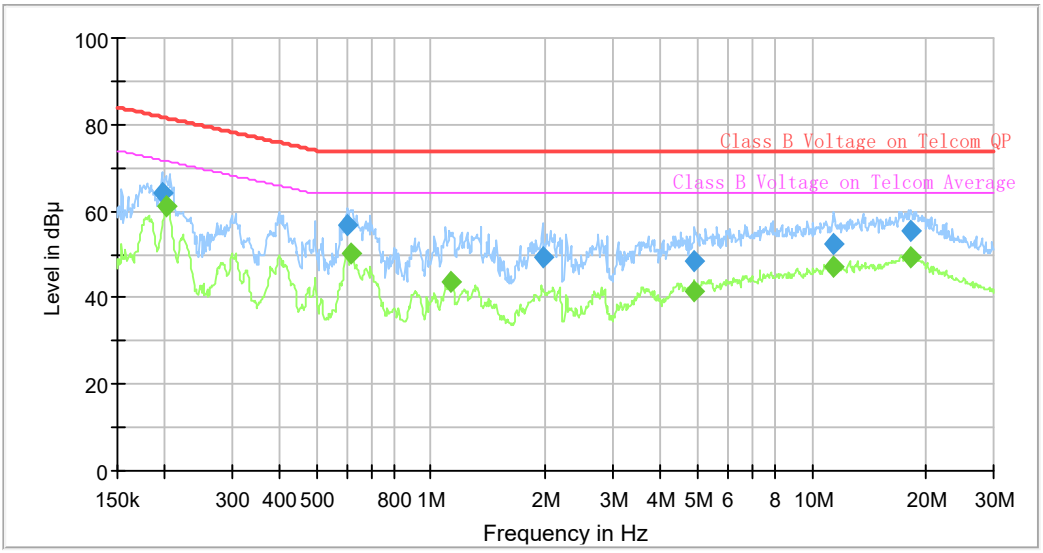
Port: WAN
Test Mode: 100Mbps
Power Source: AC 230V/50Hz
Note:



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.201321	---	60.85	71.56	10.71	9.000	Line 1	10.0
0.201321	65.43	---	81.56	16.13	9.000	Line 1	10.0
0.612239	56.58	---	74.00	17.42	9.000	Line 1	9.8
0.618376	---	51.22	64.00	12.78	9.000	Line 1	9.8
1.142032	52.45	---	74.00	21.55	9.000	Line 1	9.7
1.268136	---	43.71	64.00	20.29	9.000	Line 1	9.7
3.005345	48.30	---	74.00	25.70	9.000	Line 1	9.6
4.412464	---	44.72	64.00	19.28	9.000	Line 1	9.6
7.375399	---	48.47	64.00	15.53	9.000	Line 1	9.6
12.389561	52.87	---	74.00	21.13	9.000	Line 1	9.6
13.418776	---	51.69	64.00	12.31	9.000	Line 1	9.6
19.120678	54.10	---	74.00	19.90	9.000	Line 1	9.7

Port: WAN
Test Mode: 1000Mbps
Power Source: AC 230V/50Hz
Note:

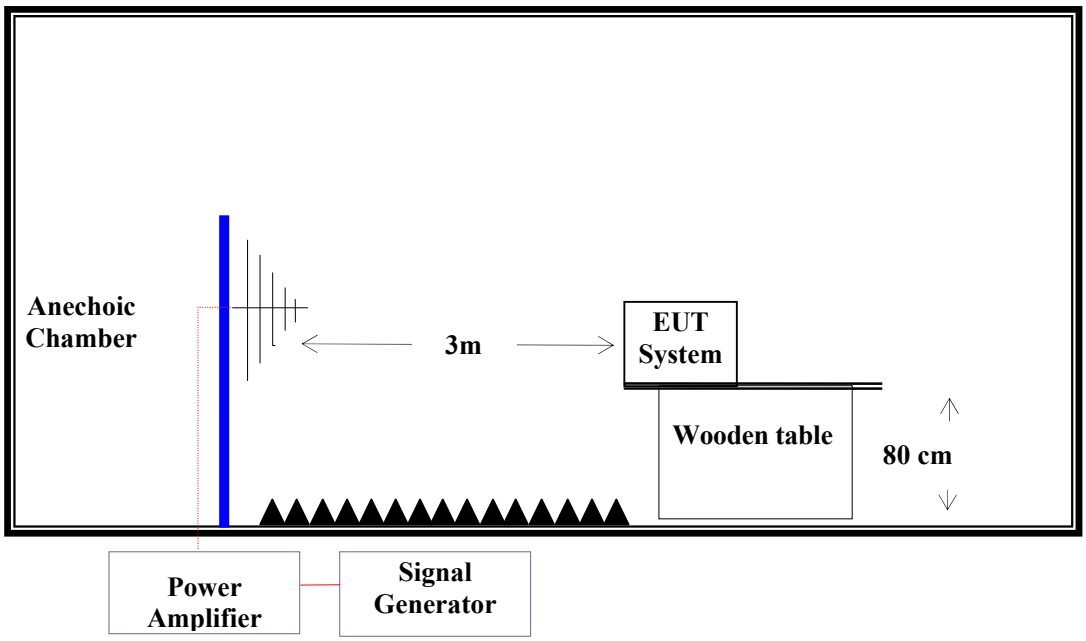


Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.196363	64.38	---	81.76	17.38	9.000	Line 1	10.1
0.202328	---	61.10	71.51	10.41	9.000	Line 1	10.0
0.603146	56.71	---	74.00	17.29	9.000	Line 1	9.8
0.618376	---	50.29	64.00	13.71	9.000	Line 1	9.8
1.125072	---	43.60	64.00	20.40	9.000	Line 1	9.7
1.966886	49.15	---	74.00	24.85	9.000	Line 1	9.6
4.924186	48.44	---	74.00	25.56	9.000	Line 1	9.6
4.924186	---	41.65	64.00	22.35	9.000	Line 1	9.6
11.382374	---	46.98	64.00	17.02	9.000	Line 1	9.6
11.439286	52.47	---	74.00	21.53	9.000	Line 1	9.6
18.099918	55.63	---	74.00	18.37	9.000	Line 1	9.6
18.190418	---	49.47	64.00	14.53	9.000	Line 1	9.7

7 – RADIO FREQUENCY ELECTROMAGNETIC FIELDS (80 MHZ TO 6 000 MHZ)

Test System Setup



Test Level

Level	Field Strength V/m
1.	1
2.	3
3.	10
X.	Special

Performance Criterion: A

General Performance Criteria:

A. The apparatus shall continue to operate as intended during and after the test. The manufacturer specifies some minimum performance level. The performance level may be specified by the manufacture as a permissible loss of performance.

B. The apparatus shall continue to operate as intended after the test. This indicates that the EUT does not need to function at normal performance levels during the test, but must recover. Again some minimal performance is defined by the manufacture. No change in operating state or loss or data is permitted.

C. Temporary loss of function is allowed. Operation of the EUT may stop as long as it is either automatically reset or can be manually restored by operation of the controls.

D. The apparatus is broken, cannot be normal operated.

Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above the ground. The EUT is set 3 meters away from the antenna which is mounted on an antenna tower. Both horizontal and vertical polarizations of the antenna are set on test. Each of the four sides of EUT must be faced the antenna and measured individually.
In order to judge the EUT performance, a CCD camera a laptop and a smartphone were used to monitor the EUT.

Test Data

Please refer to following tables:

Test Mode: Operating
Note:

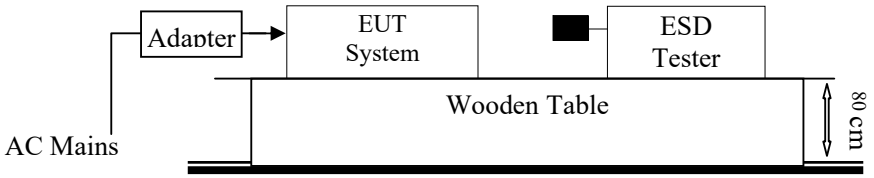
Condition of Test	Remarks
Field Strength	3 V/m (Test Level 2)
RF Signal	1 kHz, 80% AM, sine wave
Sweep Frequency Step	1%, logarithmic
Dwell Time	1 Sec

Frequency Range (MHz)	Front Side		Rear Side		Left Side		Right Side	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-1000	A	A	A	A	A	A	A	A
1000-6000	A	A	A	A	A	A	A	A

Note: “A” stand for, during test, operate as intended no loss of function, no degradation of performance, no unintentional transmissions and after test, no degradation of performance, no loss of function, no loss of stored data or user programmable functions.

8 - ELECTROSTATIC DISCHARGES

Test System Setup



Remark: ■ is the tip of the electrode

EN 61000-4-2 specifies that a tabletop EUT shall be placed on a non-conducting table which is 80 centimeters above a ground reference plane and that floor mounted equipment shall be placed on a insulating support approximately 10 centimeters above a ground plane. During the tests, the EUT is positioned over a ground reference plane in conformance with this requirement.

For tabletop equipment, a 1.6 by 0.8-meter metal sheet (HCP) is placed on the table and connected to the ground plane via a metal strap with two 470 k Ohms resistors in series. The EUT and attached cables are isolated from this metal sheet by *0.5-millimeter* thick insulating material. A Vertical Coupling Plane (VCP) grounded on the ground plane through the same configuration as in the HCP is used.

Test Level

Level	Test Voltage Contact Discharge (±kV)	Test Voltage Air Discharge (±kV)
1.	2	2
2.	4	4
3.	6	8
4.	8	15
X.	Special	Special

Test Level 3 for Air Discharge at ±8 kV
Test Level 2 for Direct Discharge at ±4 kV

Performance criterion: B

Test Procedure

Air Discharge:

This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

Contact Discharge:

All the procedure shall be same as Section 8.3.1 of EN 61000-4-2, except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

Indirect discharge for horizontal coupling plane

At least 50 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

Indirect discharge for vertical coupling plane

At least 50 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

Test Data

Please refer to following tables:

Test Mode: Operating
Note:

Table 1: Electrostatic Discharge Immunity (Air Discharge)

Test Points Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-8 kV	+8 kV	-15 kV	+15 kV
Non-metallic Shell	A	A	A	A	A	A	/	/
DC Port	A	A	A	A	A	A	/	/
DC Cable	A	A	A	A	A	A	/	/
Seam	A	A	A	A	A	A	/	/
Button	A	A	A	A	A	A	/	/
Adapter	A	A	A	A	A	A	/	/

Table 2: Electrostatic Discharge Immunity (Direct Contact)

Test Points Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
/	/	/	/	/	/	/	/	/

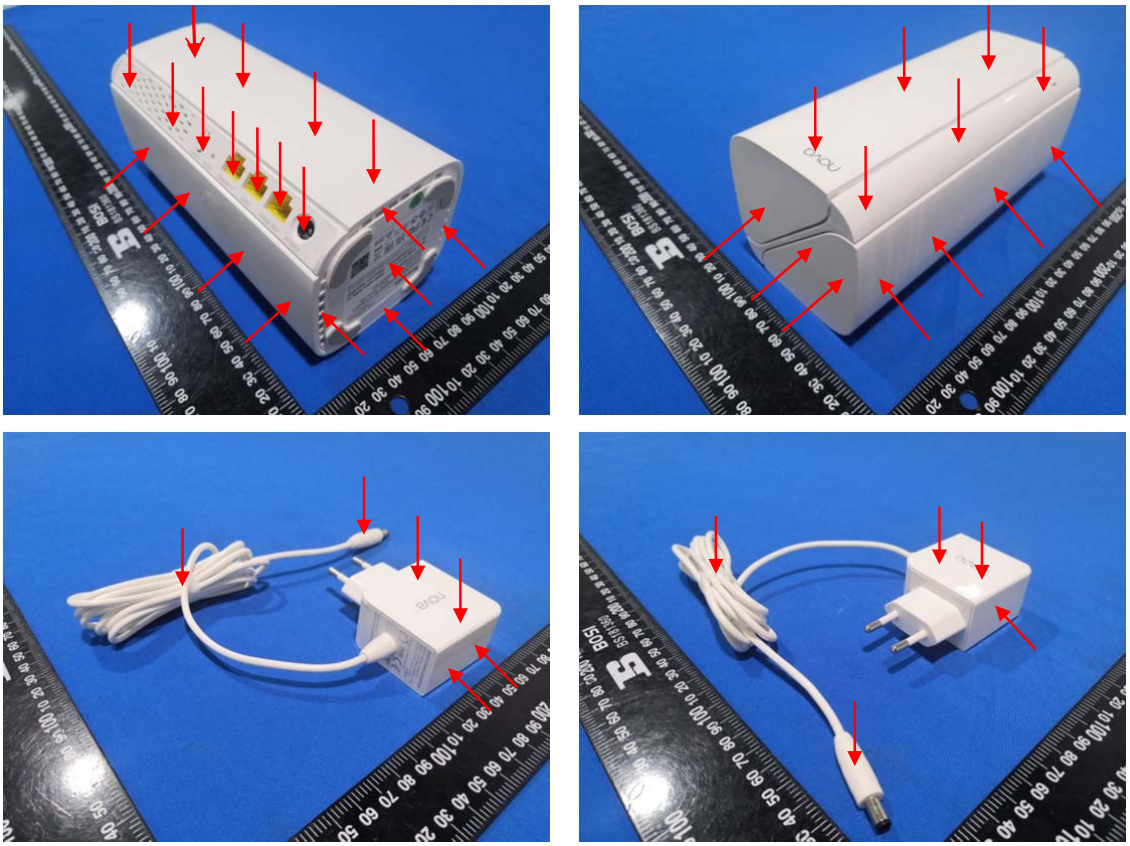
Table 3: Electrostatic Discharge Immunity (Indirect Contact HCP)

Test Points Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
Front Side	A	A	A	A	/	/	/	/
Back Side	A	A	A	A	/	/	/	/
Left Side	A	A	A	A	/	/	/	/
Right Side	A	A	A	A	/	/	/	/

Table 4: Electrostatic Discharge Immunity (Indirect Contact VCP)

Test Points Location	Test Level							
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV
Front Side	A	A	A	A	/	/	/	/
Back Side	A	A	A	A	/	/	/	/
Left Side	A	A	A	A	/	/	/	/
Right Side	A	A	A	A	/	/	/	/

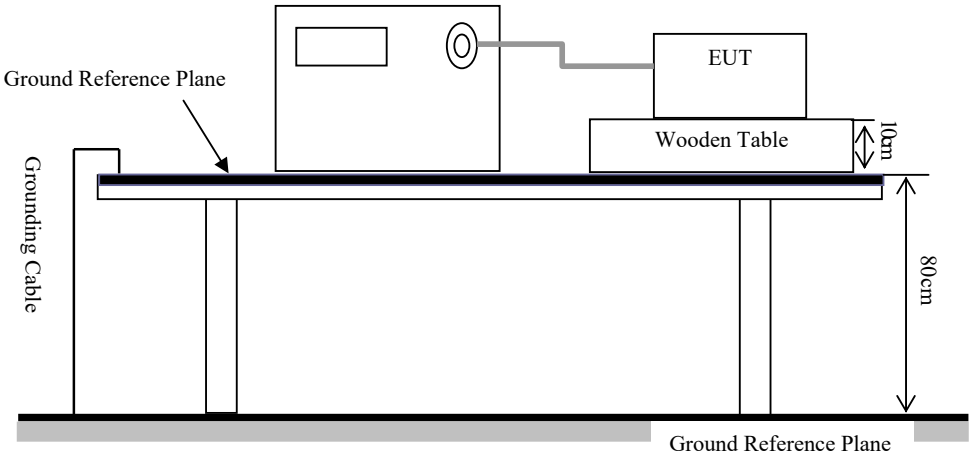
ESD Location Photo



Air Discharge: → Direct Contact: →

9 - FAST TRANSIENTS, COMMON MODE

Test System Setup



Test Level

Open Circuit Output Test Voltage ±10%		
Level	**On Power Supply Lines**	**On I/O (Input/Output) Signal data and control lines**
1	0.5 kV	0.25 kV
2	1 kV	0.5 kV
3	2 kV	1 kV
4	4 kV	2 kV
X	Special	Special

Test Level 2 for AC power supply lines at 1 kV

Performance Criterion: B

Test Procedure

The EUT was arranged for Power Line Coupling and for I/O Line Coupling through a capacitive clamp, where applicable. (Note: The I/O coupling test using a capacitive clamp is performed on the I/O interface cables that are longer in length than 3 meters.) A metal ground plane 2.4 meter by 2.0 meter was placed between the floor and the table and is connected to the earth by a 2.0 meter ground rod. The ground rod is connected to the test facility's electrical earth.

Test Data

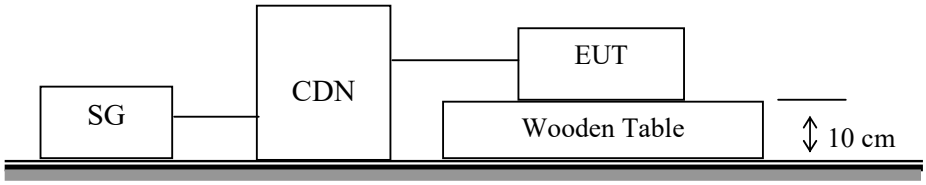
Please refer to following tables:

Test Mode: **Operating**
Note:

Test Points		Test Level (kV)							
		+0.5	-0.5	+1.0	-1.0	+2.0	-2.0	+4.0	-4.0
AC mains power input ports	L	A	A	A	A	/	/	/	/
	N	A	A	A	A	/	/	/	/
	Earth	/	/	/	/	/	/	/	/
	L+N	A	A	A	A	/	/	/	/
	L + Earth	/	/	/	/	/	/	/	/
	N + Earth	/	/	/	/	/	/	/	/
	L+N+Earth	/	/	/	/	/	/	/	/
Signal ports	RJ45	A	A	/	/	/	/	/	/

10 - RADIO FREQUENCY, COMMON MODE

Test System Setup



Test Level

Level	Voltage Level (r.m.s.) (U_0)
1	1
2	3
3	10
X	Special

Test level 2 at 3 V (r.m.s.)

Performance Criterion: A

Test Procedure

1) Let the EUT work in test mode and test it.
2) The EUT are placed on an insulating support 0.1 m high above a ground reference plane. CDN (coupling and decoupling device) is placed on the ground plane about 0.3 m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
3) The disturbance signal described below is injected to EUT through CDN.
4) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
5) The frequency range is swept from 150 kHz to 80 MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave.
6) Where the frequency is swept incrementally, the step size shall not exceed 1 % of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5 s.
7) Recording the EUT Communication situation during compliance testing and decide the EUT immunity criterion.

Test Data

Please refer to following tables:

Test Mode: Operating
Note:

Table 1: AC mains power input port

Frequency range: 150 kHz to 80 MHz
■Modulated: Amplitude 80%, 1kHz sine wave □ Unmodulated □ Other:
Severity Level: 3 V Unmodulated , r.m.s

Level	Voltage Level (e.m.f.) U_0	Pass	Fail
1	1	/	/
2	3	A	/
3	10	/	/
X	Special	/	/

Table 2: Signal Port : RJ45

Frequency range: 150 kHz to 80 MHz
■Modulated: Amplitude 80%, 1kHz sine wave □Unmodulated □ Other:
Severity Level: 3 V Unmodulated , r.m.s

Level	Voltage Level (e.m.f.) U_0	Pass	Fail
1	1	/	/
2	3	A	/
3	10	/	/
X	Special	/	/

11 TRANSIENTS AND SURGES IN THE VEHICULAR ENVIRONMENT

Test Level

Table B.2 — Suggested limits for the classification of nominal 12 V equipment

Pulse amplitude (U_s)	Suggested limit for U_s for severity levels I to V			
	I / II	III	IV	V[a]
Positive slow pulses (ms range or slower)	+25 V	+37 V	+75 V	
Negative slow pulses (ms range or slower)	–50 V	–75 V	–100 V	
Positive fast pulses (µs to ns range)	+50 V	+75 V	+100 V	
Negative fast pulses (µs to ns range)	–75 V	–112 V	–150 V	
[a] Values to be determined by vehicle manufacturer and equipment supplier.				

Table B.3 — Suggested limits for the classification of nominal 24 V equipment

Pulse amplitude (U_s)	Suggested limit for U_s for severity levels I to V			
	I / II	III	IV	V[a]
Positive slow pulses (ms range or slower)	+25 V	+37 V	+75 V	
Negative slow pulses (ms range or slower)	–100 V	–150 V	–200 V	
Positive fast pulses (µs to ns range)	+100 V	+150 V	+200 V	
Negative fast pulses (µs to ns range)	–100 V	–150 V	–200 V	
[a] Values to be determined by vehicle manufacturer and equipment supplier.				

Test level III Applied.

Performance Criterion: B

Where, pulse 3a and 3b are applied, the performance criteria for continuous phenomena shall apply.

Where pulse 1, 2a, 2b, and 4 are applied, the performance criteria for transient phenomena shall apply , with the exception that a communication link need not to be maintained during the EMC exposure and may have to be re-established.

Test Procedure

The test method shall be in accordance with ISO 7637-2 [8], clause 4 for 12 V DC and 24 V DC powered equipment.

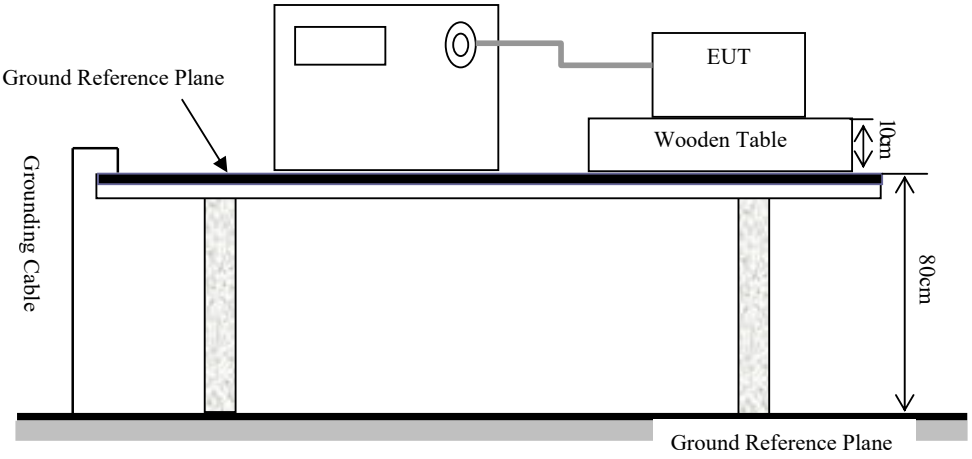
The test method shall be in accordance with ISO 7637-2 [8], clause 4, applying pulses 1, 2a, 2b, 3a, 3b, and 4, using immunity test level III. For the purpose of EMC testing it is sufficient to apply pulses 1, 2a, 2b and 4, 10 times each, and apply the test pulses 3a and 3b for 20 minutes each.

Test Data

Not Applicable: Please refer to Applicability overview tables in sections 7.1 and 7.2 of EN 301 489-1 requirements for Radio and ancillary equipment.

12 - VOLTAGE DIPS AND SHORT INTERRUPTIONS

Test System Setup



Test Level and Performance Criterion

Test Level	Voltage dip and short interruptions (%) Residual	Duration (in period)	Performance criterion
1	0	0.5	B
2	0	1	B
3	70	25	C
4	0	250	C

Test Procedure

1) The interruption is introduced at selected phase angles with specified duration.
2) Record any degradation of performance.

Test Data

Please refer to following tables:

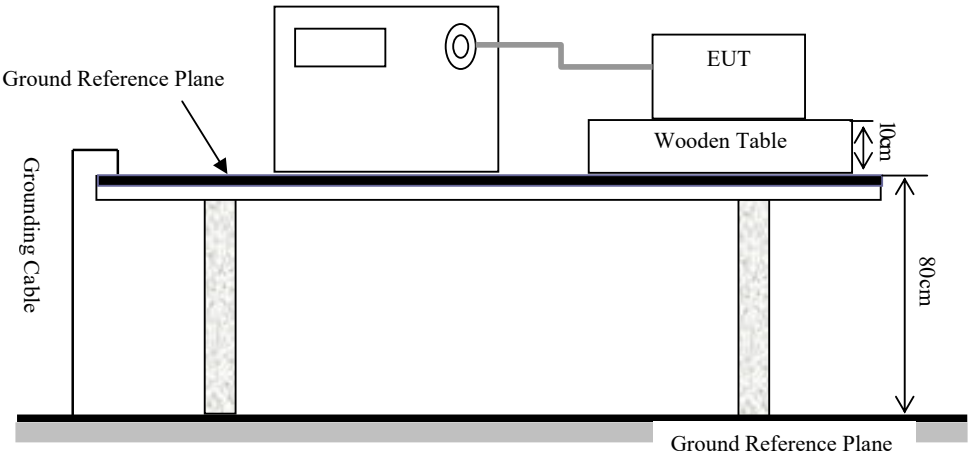
Test Mode: **Operating**

Note: **B indicates that the power supply of the EUT was interrupted during the test, and the EUT was restarted. After the test, it can automatically return to normal use.**

U2 (% Reduction)	Td (Periods)	Phase Angle	N	Result
100	0.5	0/90/180/270	3	A
100	1	0/90/180/270	3	A
30	25	0/90/180/270	3	A
100	250	0/90/180/270	3	B

13 - SURGES

Test System Setup



Test Level

Level	Open Circuit Output Test Voltage ±10%
1	0.5 kV
2	1 kV
3	2 kV
4	4 kV
X	Special

Performance Criterion: B

Test Procedure

1) For line to line coupling mode, provide a 0.5 kV 1.2/50us voltage surge (at open-circuit condition).
2) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
3) Different phase angles are done individually.
4) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

Test Data

Please refer to following tables:

Test Mode: **Operating**
Note:

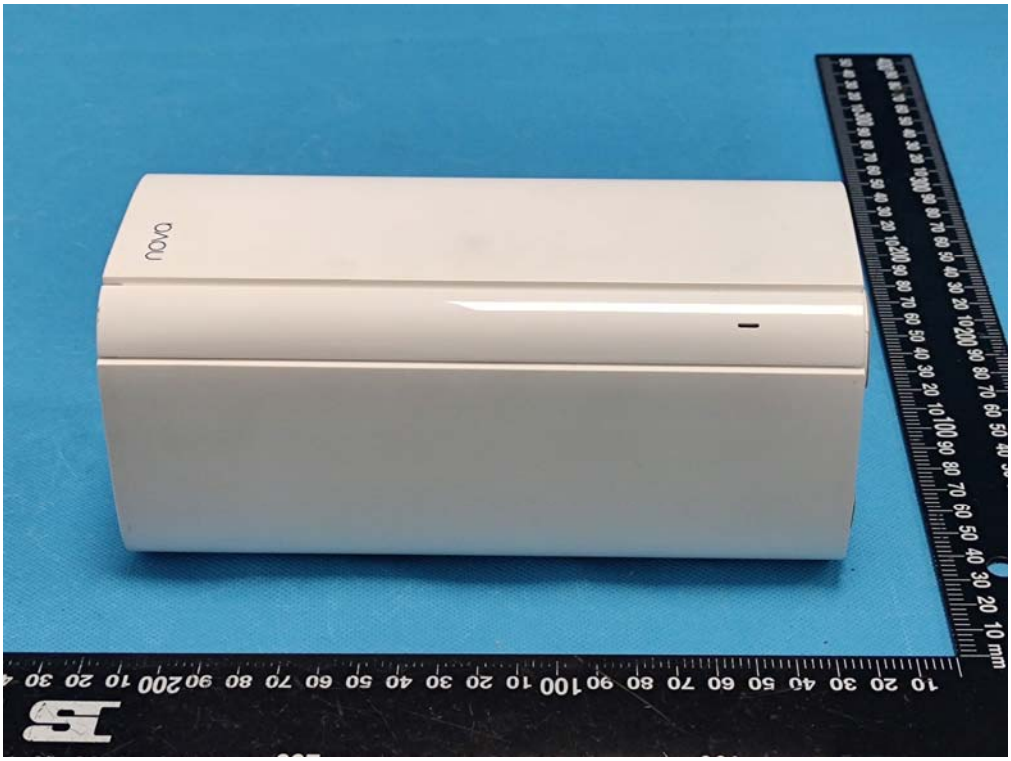
Table 1: AC mains power input port

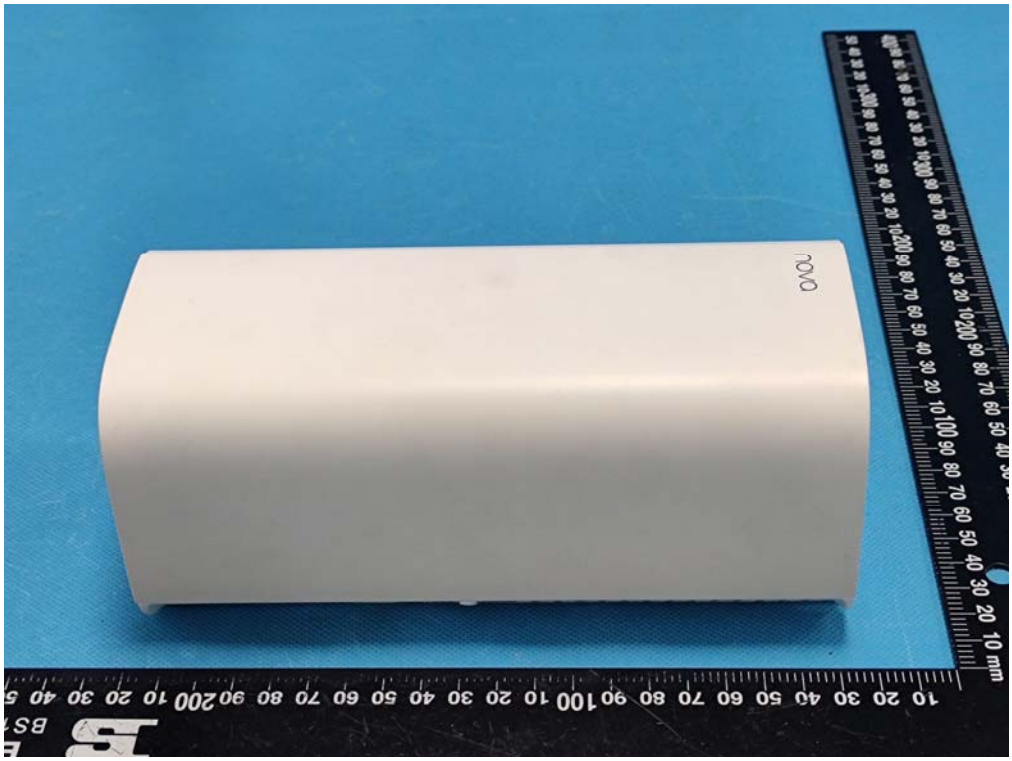
Level	Voltage	Poll	Path	Pass	Fail
1	0.5kV	±	Line-Line	A	/
2	1kV	±	Line-Line	A	/

Table 2: RJ45 I/O Circuit and Lines

Level	Voltage	Poll	Path	Pass	Fail
1	0.5kV	±	Line-Ground	A	/
2	1kV	±	Line-Ground	A	/

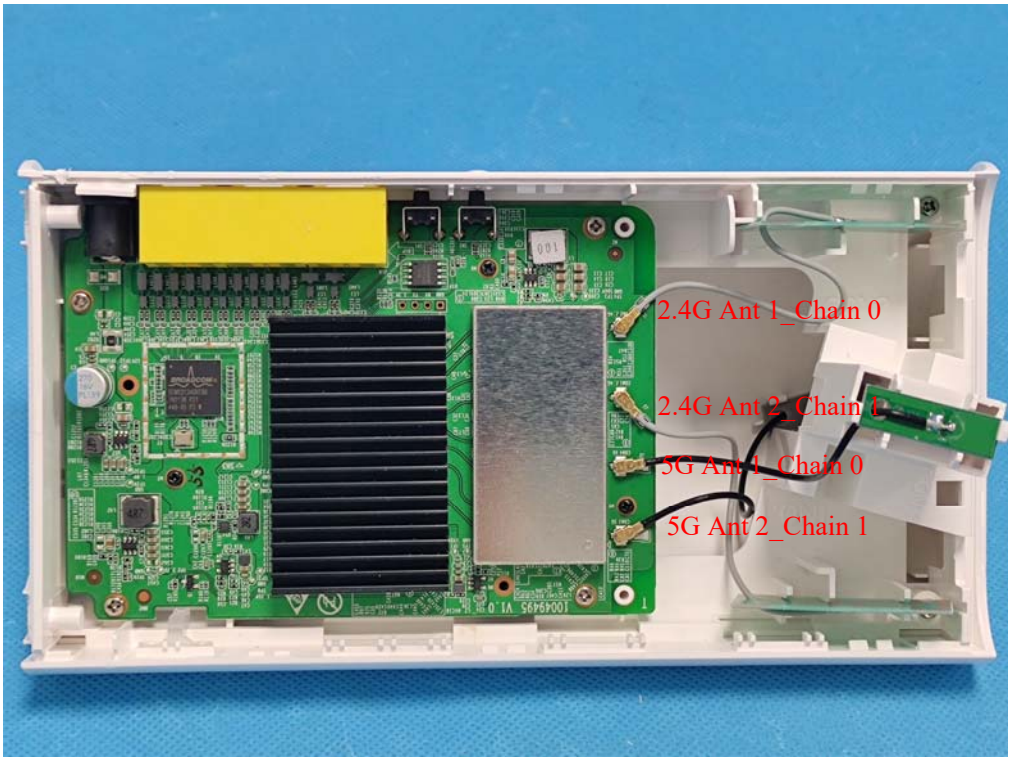
EXHIBITA – EUT PHOTOGRAPHS

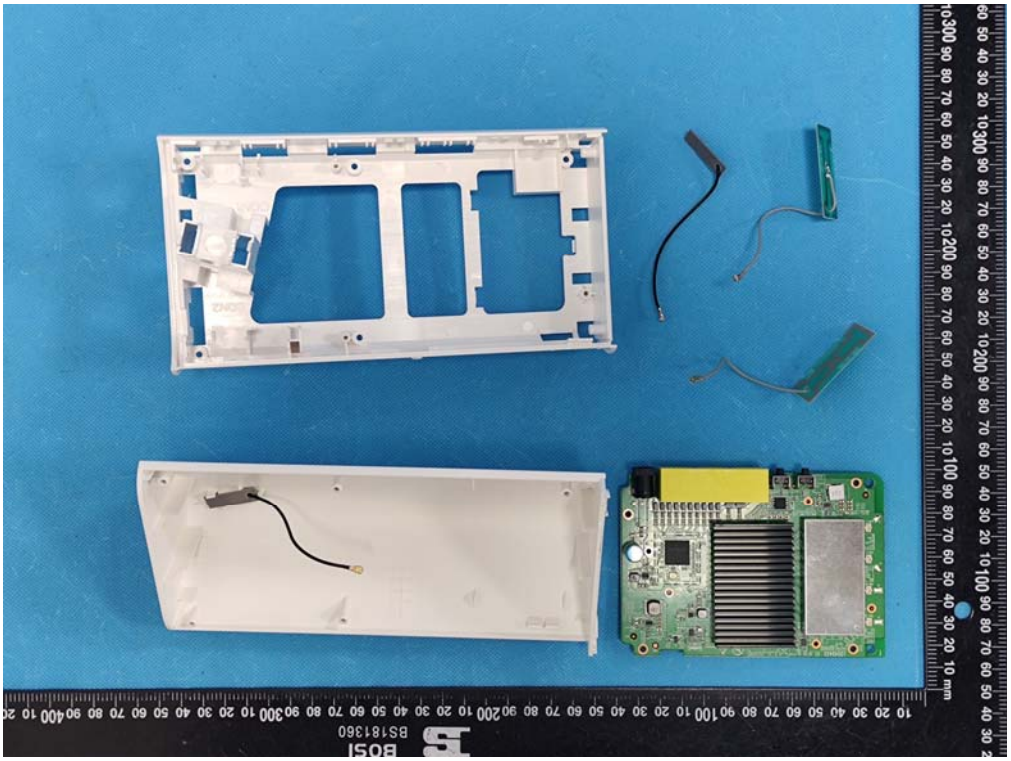



nova

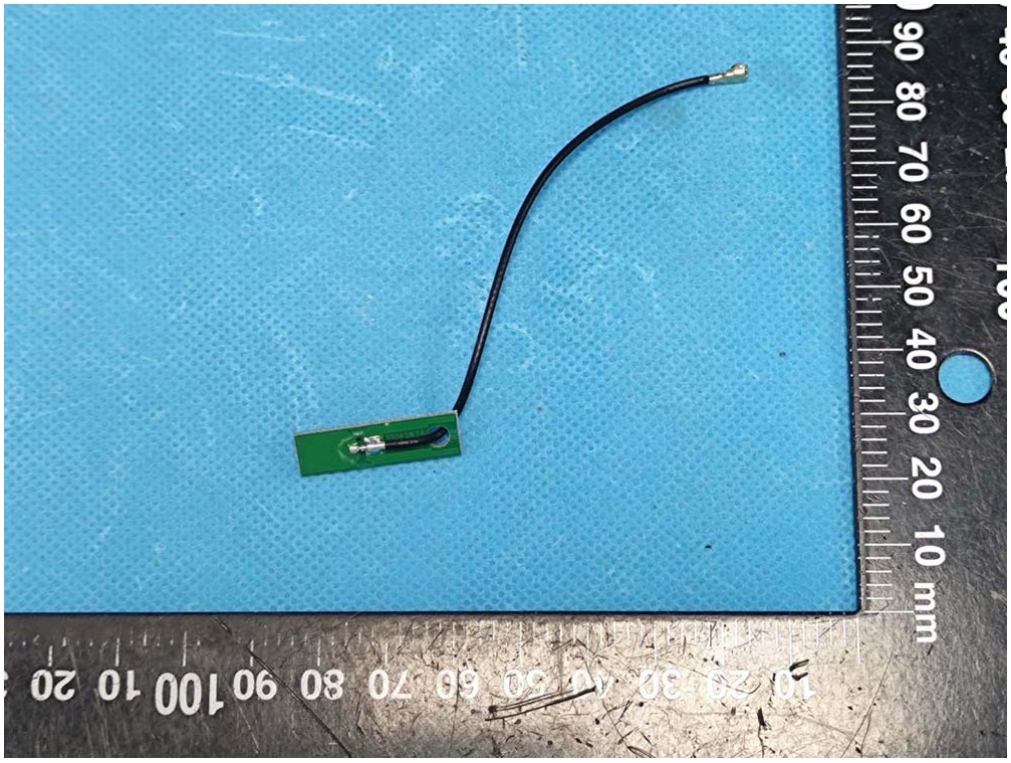

nova
Tenda
AX3000 Whole Home Mesh Wi-Fi 6 System
Model: Mesh12X
Power: 12V⎓1.5A
Login address: http://tendawifi.com
FCC ID: V7TME5H12X
MAC: 502B73FA01C0
SSID: NOVA_R3NQ_A3
Password: back4944


RESET
LAN3/IPTV
LAN2
WAN/LAN1
POWER

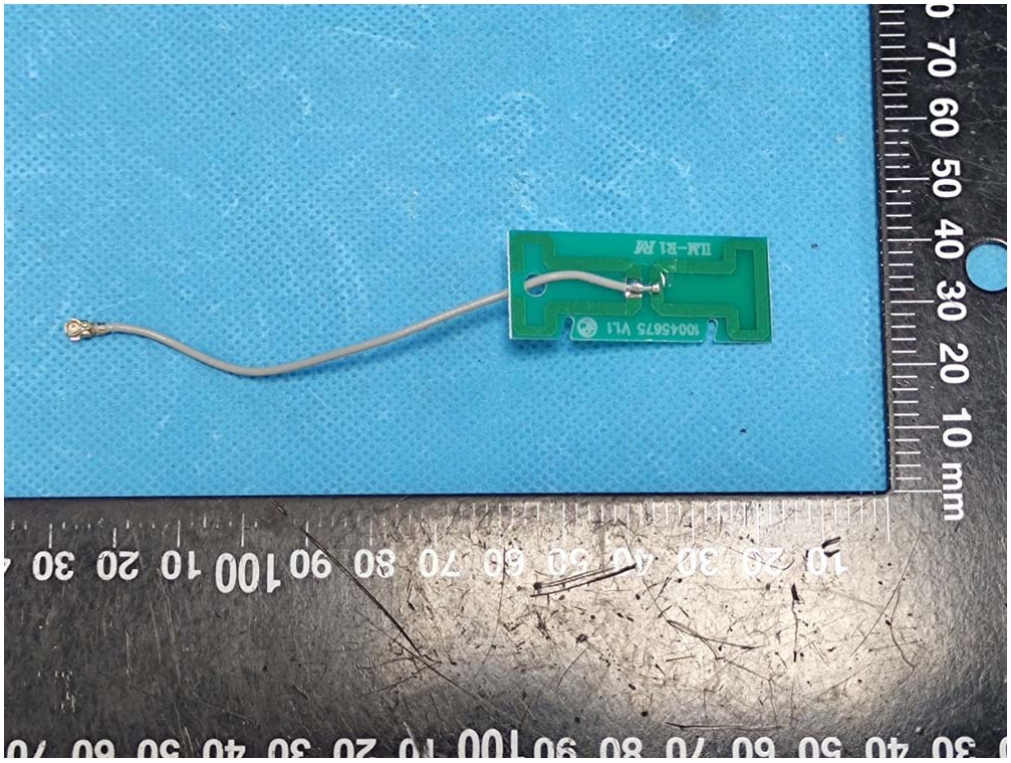

2.4G Ant 1_Chain 0
2.4G Ant 2_Chain 1
5G Ant 1_Chain 0
5G Ant 2_Chain 1

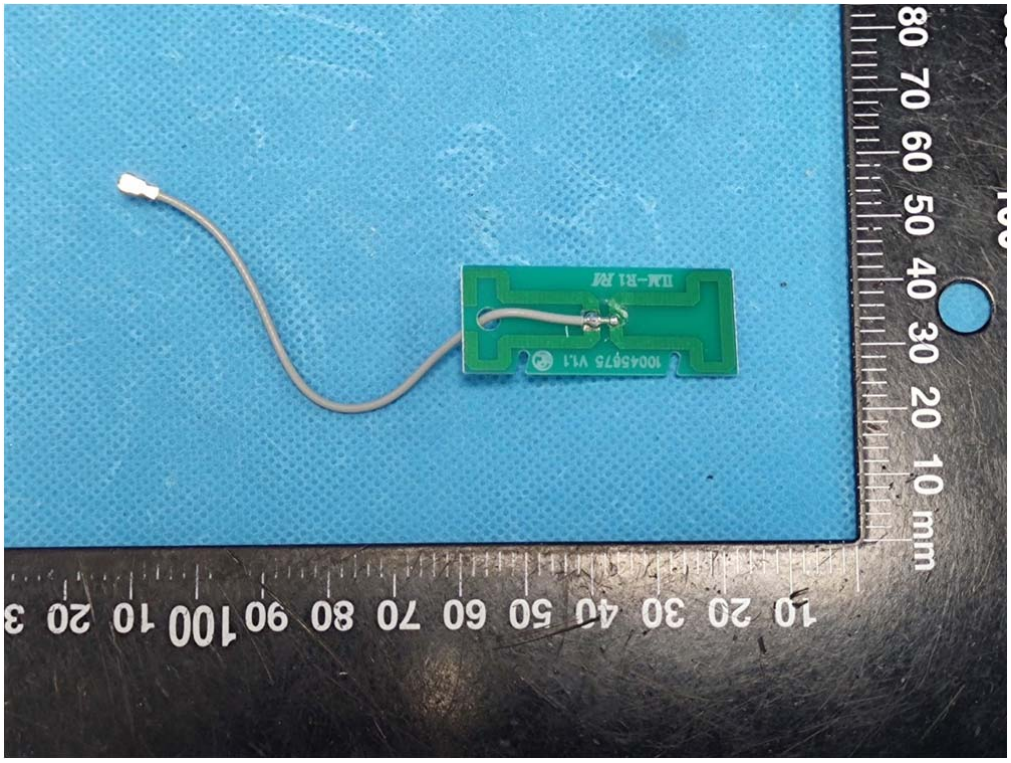


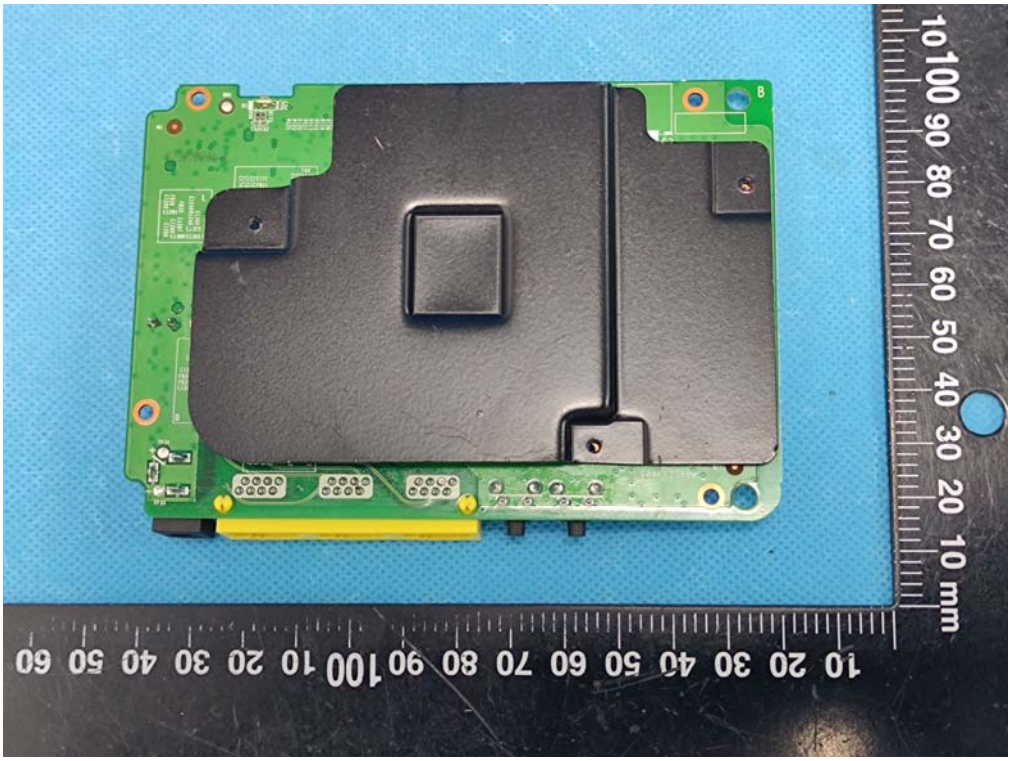
WiFi 5GHz Antenna

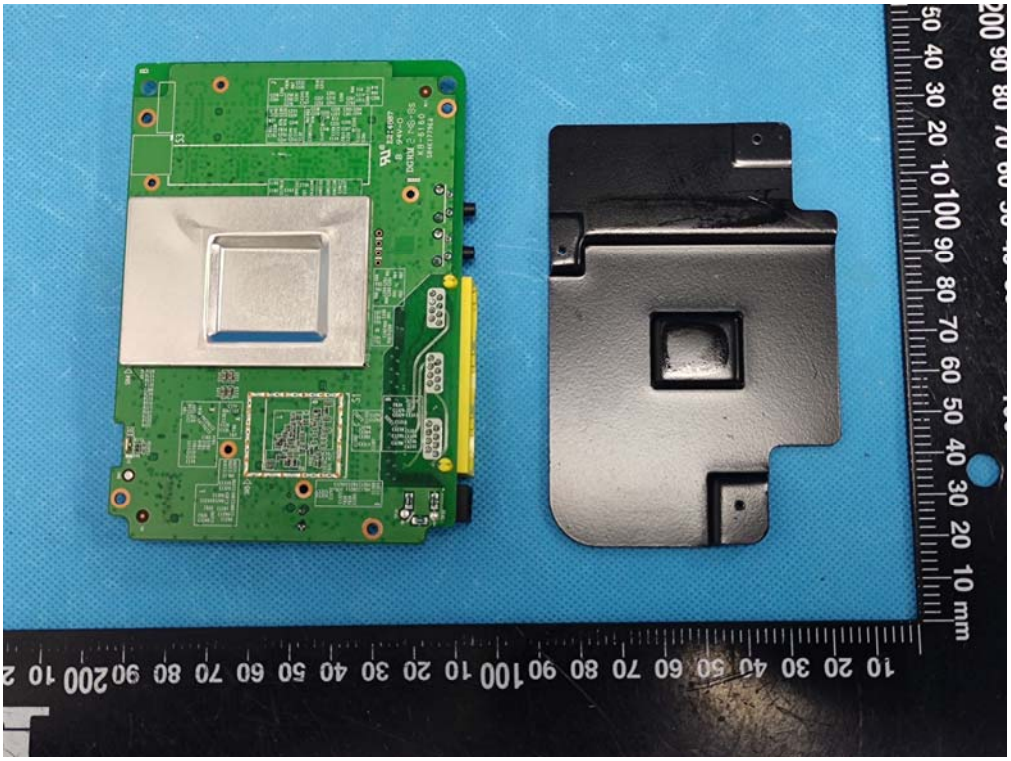


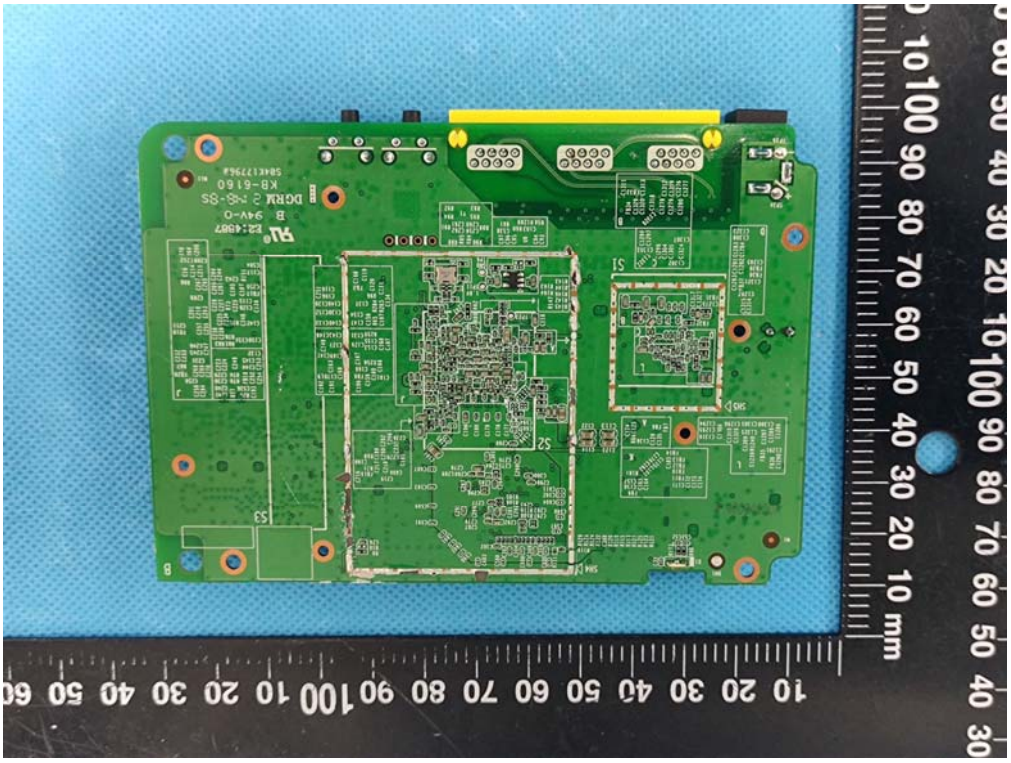
WiFi 2.4GHz Antenna

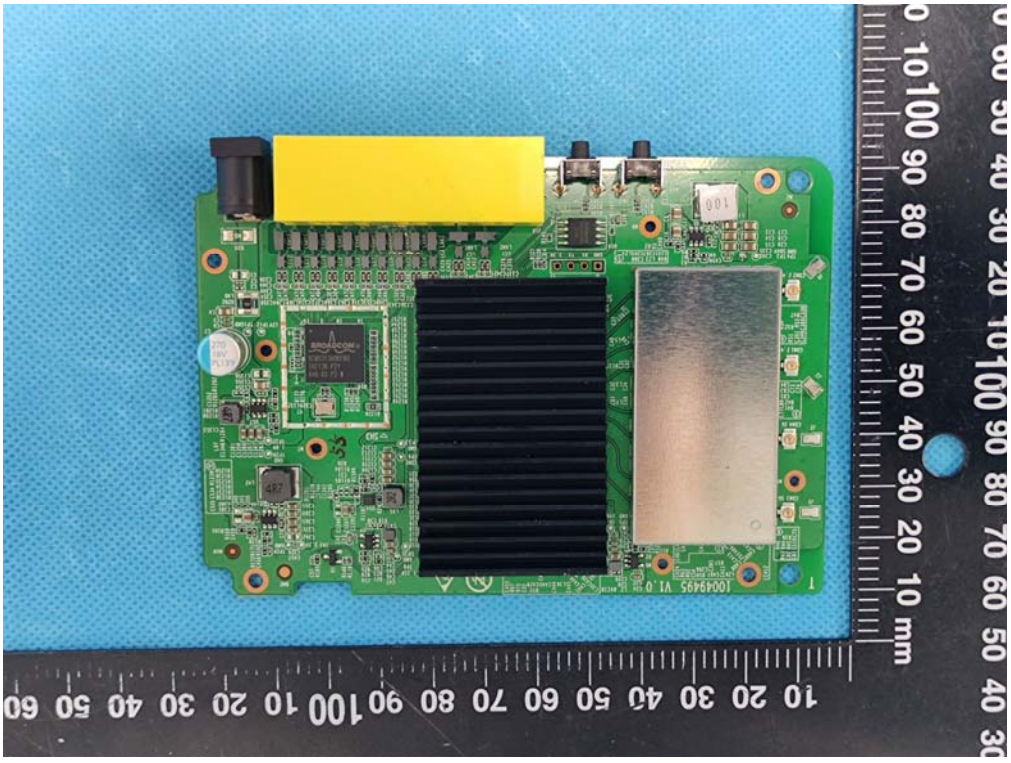


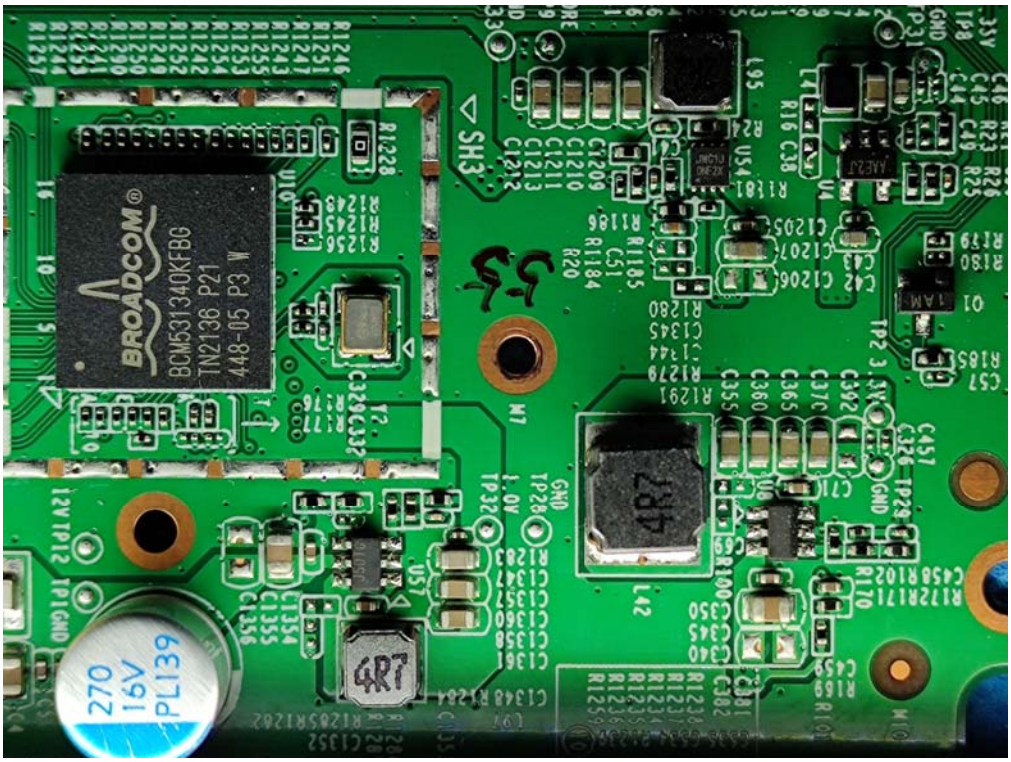


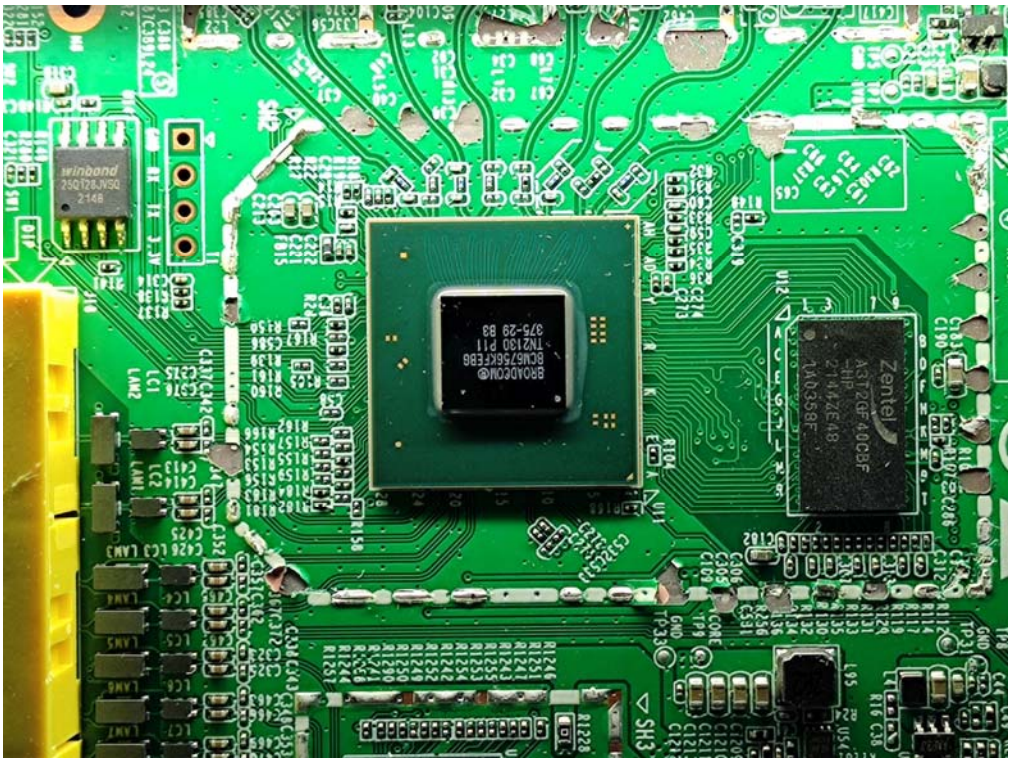









BROADCOM
BCM53134OKFBG
TN2138 P21
448-05 P3 W
270
16V
PL139
4R7
4R7




nova

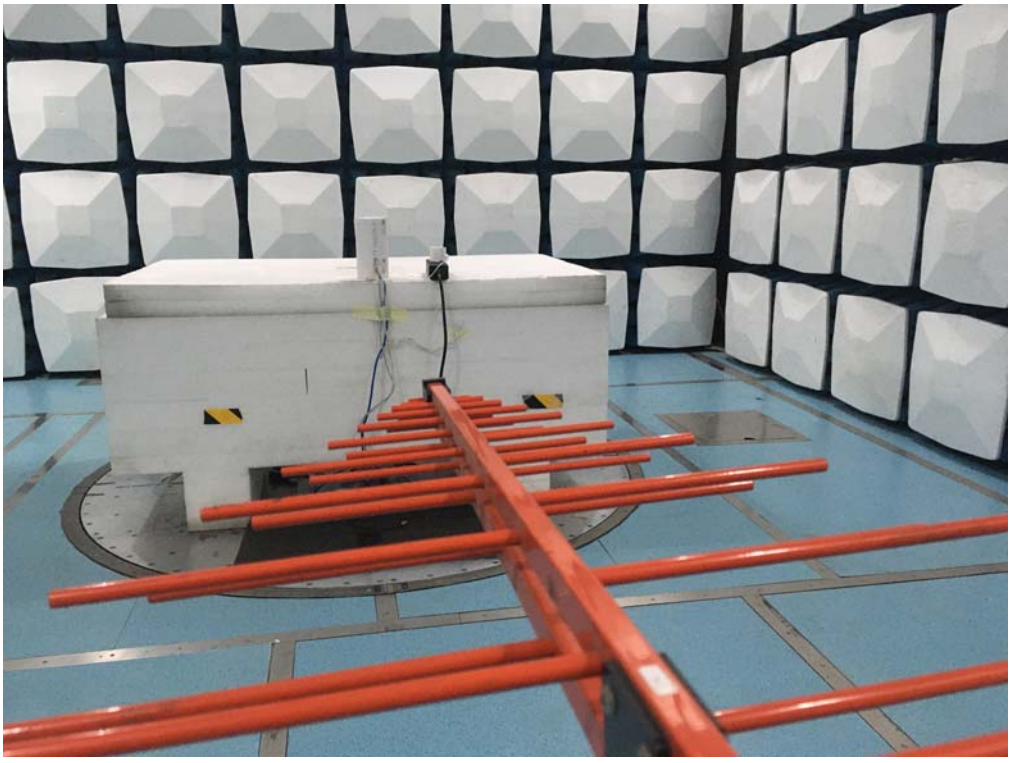

SWITCHING ADAPTER
MODEL:BN067-A18012E
INPUT :100-240V~50/60Hz 0.6A
OUTPUT:12.0V ⎓1.5A 18.0W
Warning: For indoor use only!
RoHS
COMPLIANT
MADE IN CHINA
SHENZHEN HEWEISHUN NETWORK TECHNOLOGY CO.,LTD.

EXHIBIT B – TEST SETUP PHOTOGRAPHS

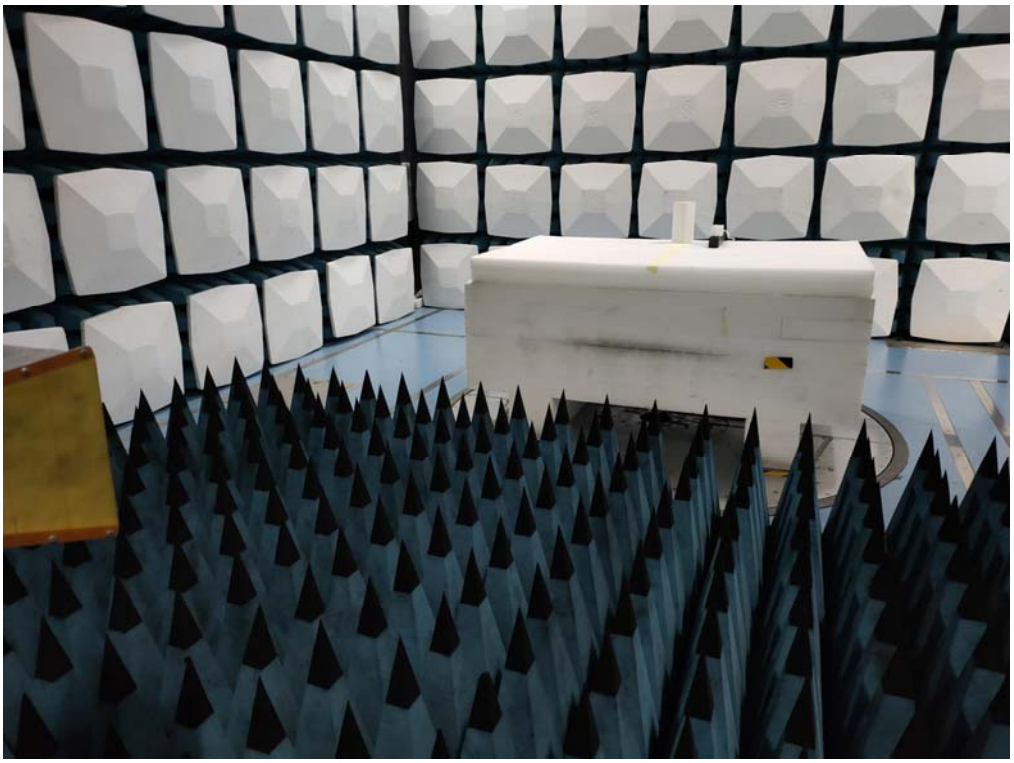
Radiated Emissions

Radiated Emissions Below 1GHz front View

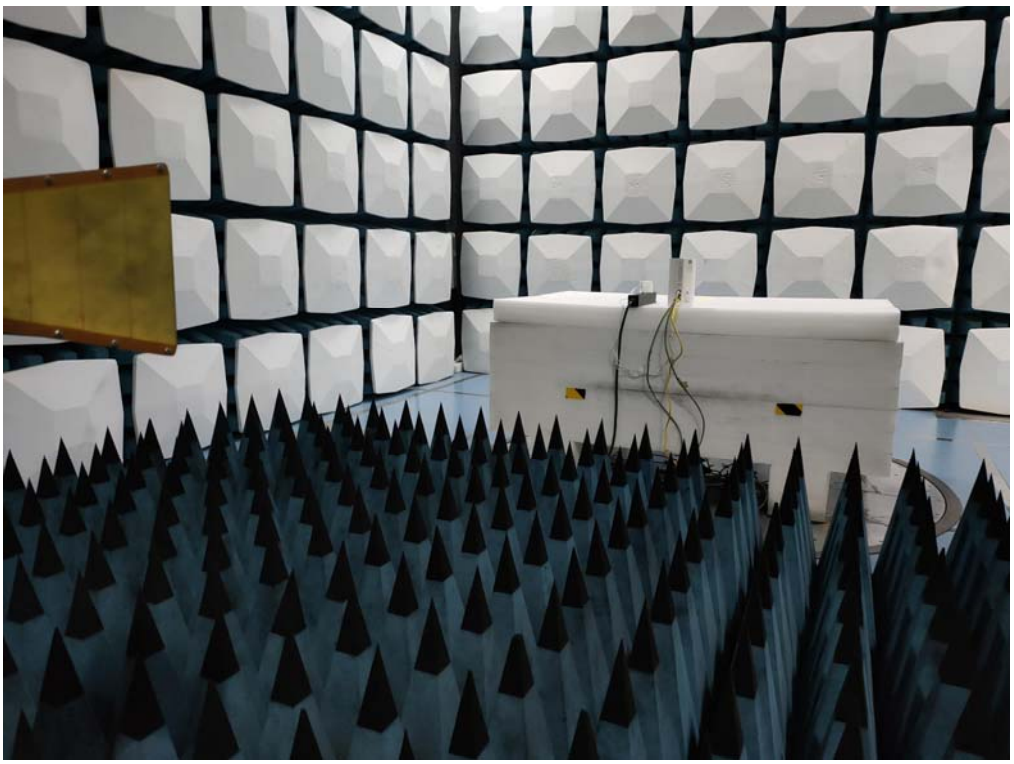
Radiated Emissions Below1GHz rear View



Radiated Emissions above 1GHz front View



Radiated Emissions above 1GHz rear View



Conducted emissions_AC

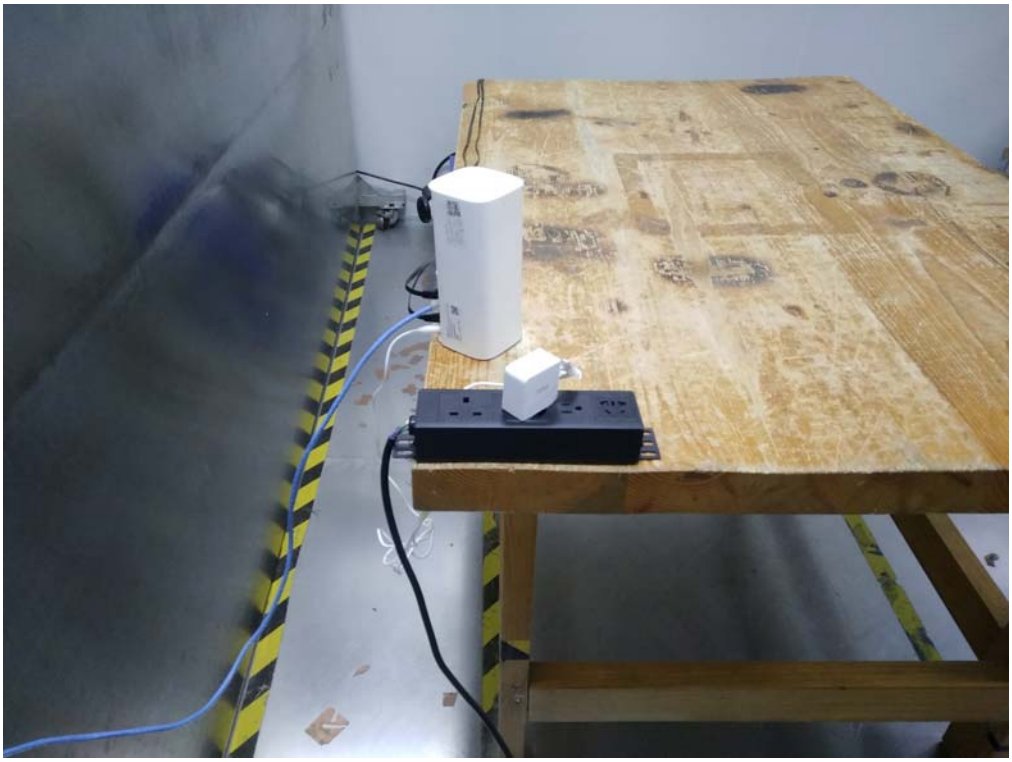
Conducted emissions front View

Conducted emissions side View

Conducted emissions_ ISN

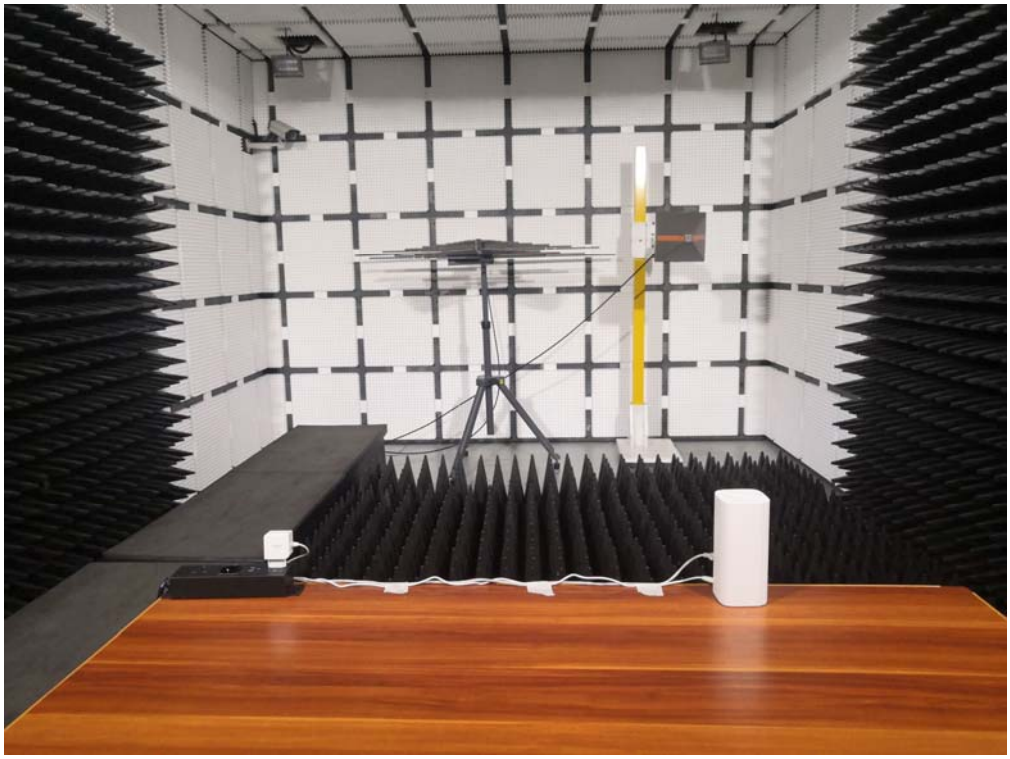
Conducted emissions front View-ISN

Conducted emissions side View-ISN



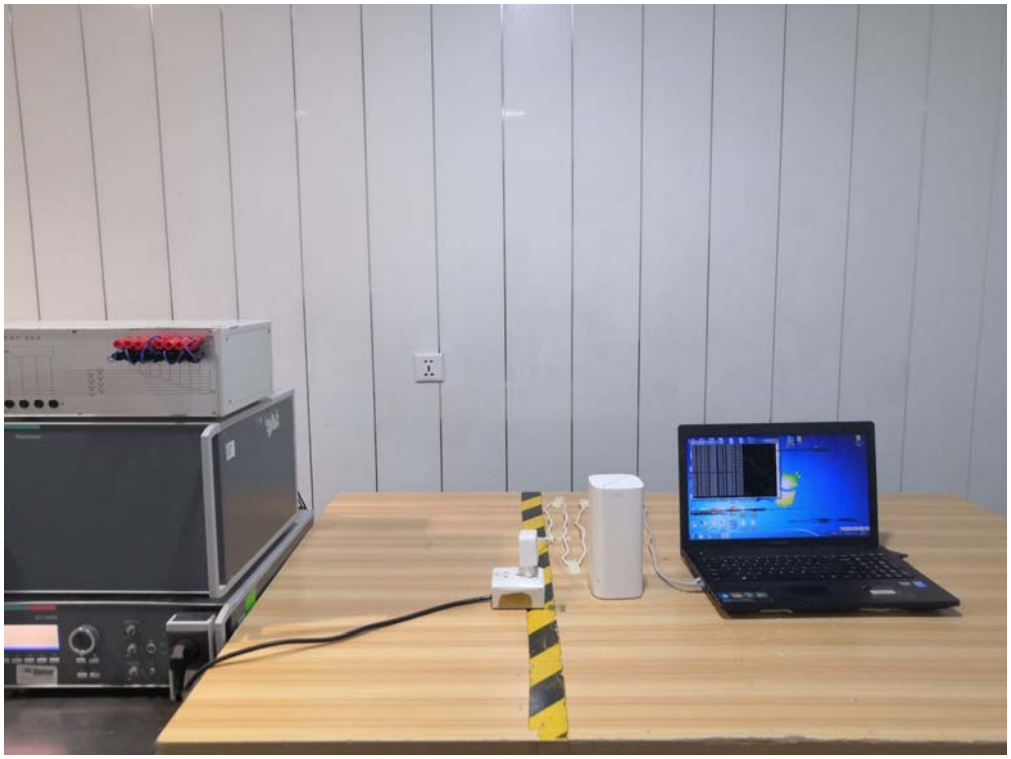
RS

Test Setup Photo View

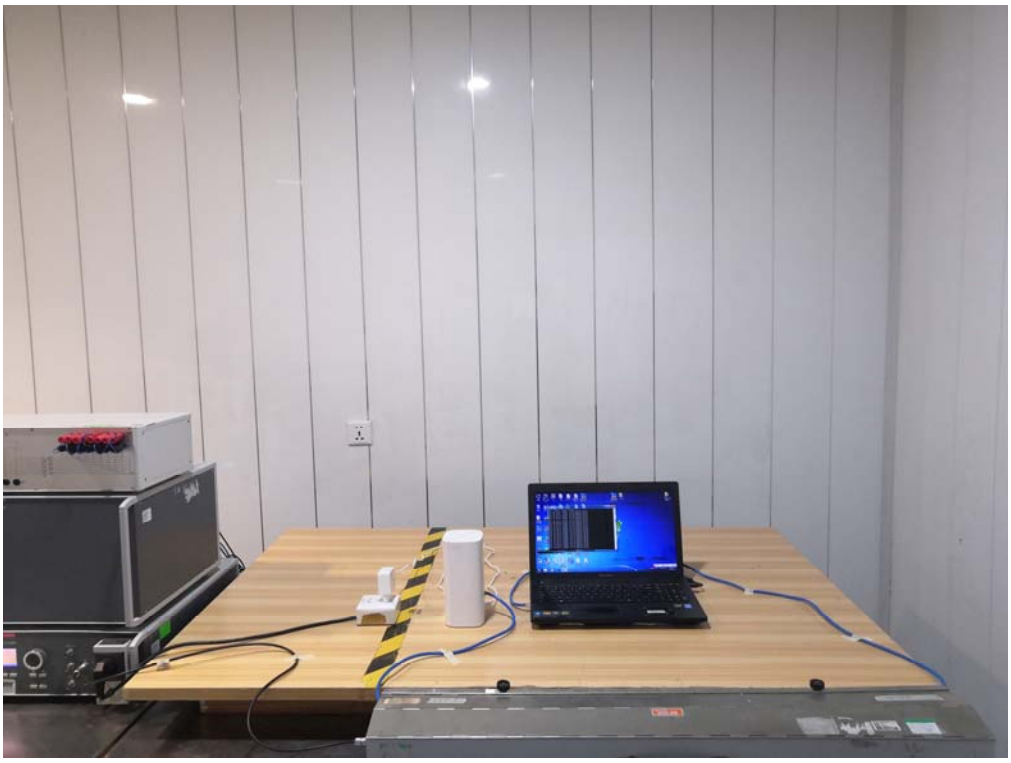


EFT

Test Setup Photo View

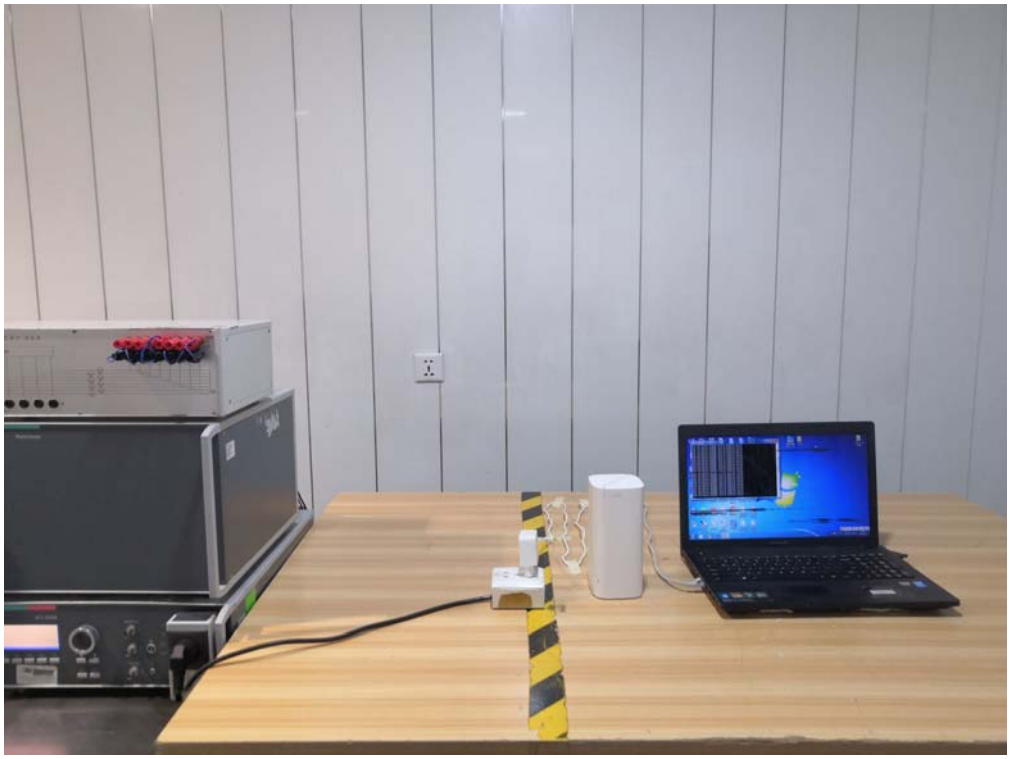


Signal Port Test Setup Photo View



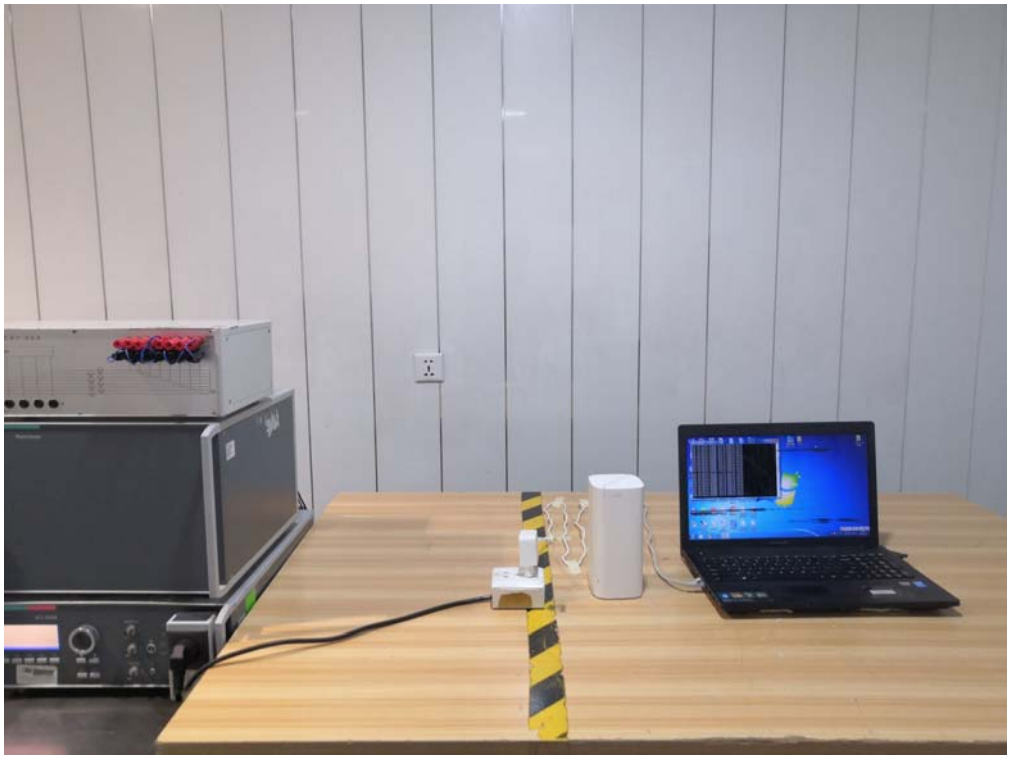
Dips

Test Setup Photo View



Surge

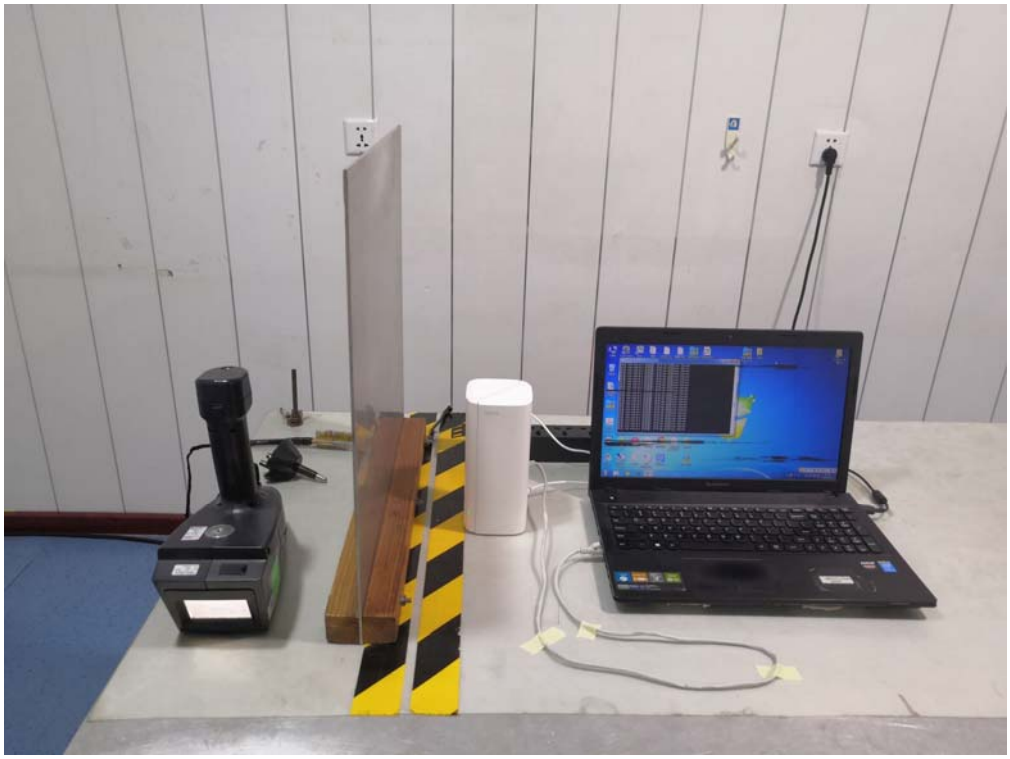
Test Setup Photo View



Signal Port Test Setup Photo View

ESD

Test Setup Photo View



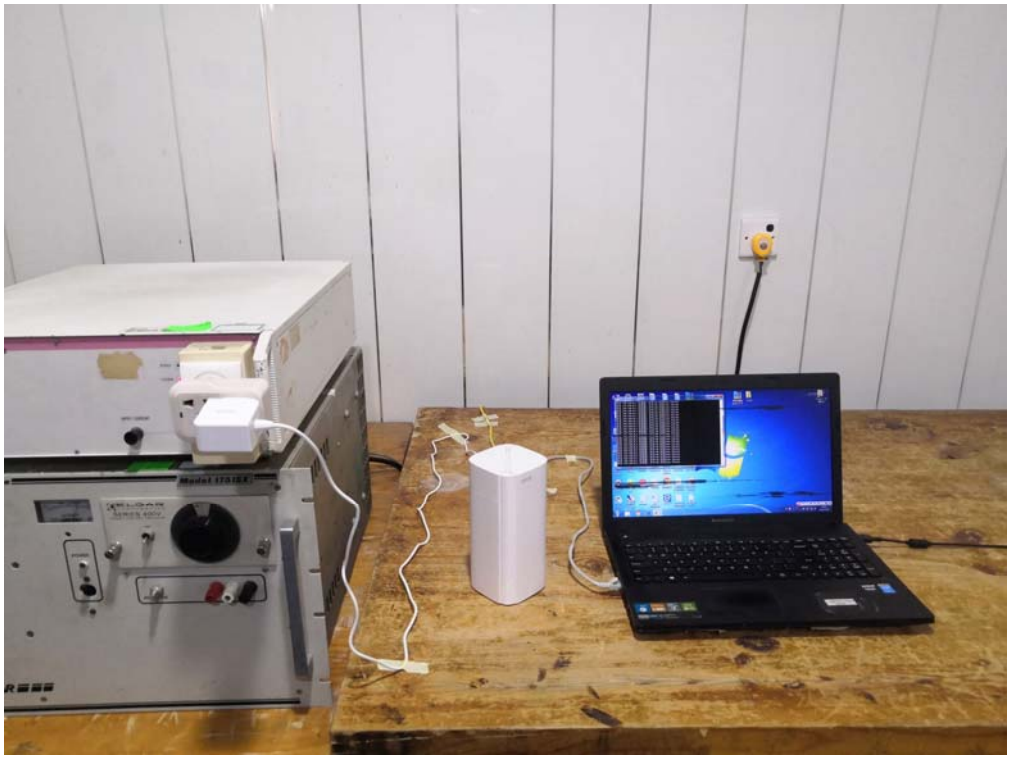
CS

Test Setup Photo View

Signal Port Test Setup Photo View

Flicker

Test Setup Photo View



DECLARATION OF SIMILARITY LETTER

SHENZHEN TENDA TECHNOLOGY CO., LTD.
ADD: 6-8 Floor, Tower E3, No. 1001, Zhongshanyuan Road, Nanshan District, Shenzhen, China. 518052
TEL: 86-755-27657098 FAX: 866-755-27657178
E-mail:cert@tenda.cn

DECLARATION OF SIMILARITY

Date: 2022-02-16

Dear Sir or Madam:

We, SHENZHEN TENDA TECHNOLOGY CO., LTD.hereby declare that the product:AX3000 Whole Home Mesh Wi-Fi 6 System, model:MX12,EX12,EM12 is electrically identical with the model:Mesh12X by BACL(Dongguan) with the same electromagnetic emissions and which was tested electromagnetic compatibility characteristics.

A description of the differences between those models and that are declared similar are as follows:

They are the same product, and just the different of the model name , the rest are the same.

Please contact me should there be need for any additional clarification or information.

Shen Yue

Best Regards,

Signature:
Printed Name: Shen Yue
Title: Engineer

*******END OF REPORT*******