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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.

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Tested Model: A23

Report Type: Original Report	Product Type: AX1500 Wi-Fi 6 Range Extender
Report Number: DG2230214-06388E-02	
Report Date: 2023/3/15	
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TABLE OF CONTENTS

DOCUMENT REVISION HISTORY	4
General Information	5
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	5
OBJECTIVE	5
TEST METHODOLOGY	5
DECLARATIONS	5
System Test Configuration	6
DESCRIPTION OF TEST CONFIGURATION.....	6
EQUIPMENT MODIFICATIONS.....	6
EUT EXERCISE SOFTWARE	6
SUPPORT EQUIPMENT LIST AND DETAILS.....	6
SUPPORT CABLE LIST AND DETAILS.....	6
BLOCK DIAGRAM OF TEST SETUP	6
TEST EQUIPMENT LIST	7
ENVIRONMENTAL CONDITIONS	8
Summary of Test Results.....	9
1 - Enclosure of ancillary equipment measured on a stand alone basis	10
MEASUREMENT UNCERTAINTY	10
TEST SYSTEM SETUP	10
EMI TEST RECEIVER AND SPECTRUM ANALYZER SETUP	11
TEST PROCEDURE.....	11
CORRECTED AMPLITUDE & MARGIN CALCULATION.....	11
TEST DATA.....	12
3 - AC mains power input/output ports	20
TEST SYSTEM SETUP	20
EMI TEST RECEIVER SETUP	20
TEST PROCEDURE.....	20
CORRECTED AMPLITUDE & MARGIN CALCULATION.....	20
TEST DATA.....	21
5 - Voltage fluctuations and flicker (AC mains input port).....	25
TEST SYSTEM SETUP	25
TEST STANDARD	25
TEST DATA.....	26
6 - Wired network ports	27
TEST SYSTEM SETUP	27
EMI TEST RECEIVER SETUP	27
TEST PROCEDURE.....	27
CORRECTED AMPLITUDE & MARGIN CALCULATION.....	27
TEST DATA.....	28
7 - Radio frequency electromagnetic fields (80 MHz to 6 000 MHz).....	31
TEST SYSTEM SETUP	31
TEST LEVEL	31
TEST PROCEDURE.....	32
TEST DATA.....	32
8 - Electrostatic discharges.....	33
TEST SYSTEM SETUP	33
TEST LEVEL	33
TEST PROCEDURE.....	33

TEST DATA..... 34

9 - Fast transients, common mode 36

TEST SYSTEM SETUP 36

TEST LEVEL 36

TEST PROCEDURE..... 36

TEST DATA..... 37

10 - Radio frequency, common mode 38

TEST SYSTEM SETUP 38

TEST LEVEL 38

TEST PROCEDURE..... 38

TEST DATA..... 39

12 - Voltage dips and short interruptions 40

TEST SYSTEM SETUP 40

TEST LEVEL AND PERFORMANCE CRITERION 40

TEST PROCEDURE..... 40

TEST DATA..... 40

13 - Surges..... 41

TEST SYSTEM SETUP 41

TEST LEVEL 41

TEST PROCEDURE..... 41

TEST DATA..... 42

ExhibitA - Eut Photographs..... 43

ExhibitB - Test Setup Photographs 52

RE..... 52

CE_AC 54

CE_NET..... 55

FLICKER 56

RS 57

ESD 58

EFT 59

DIPS 60

SURGE 61

CS..... 62

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	DG2230214-06388E-02	Original Report	2023/3/15

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Name:	AX1500 Wi-Fi 6 Range Extender
Tested Model:	A23
Rated Input Voltage:	100-240Vac
Serial Number:	21C4
EUT Received Date:	2023/2/16
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;

The objective is to determine the compliance of EUT with: ETSI EN 301 489-1 V2.2.3 (2019-11), ETSI EN 301 489-17 V3.2.4 (2020-09).

Test Methodology

All measurements contained in this report were conducted 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.

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.

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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:

M1: operating

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

Software “LanTest.exe”&”Ping.exe” were used.

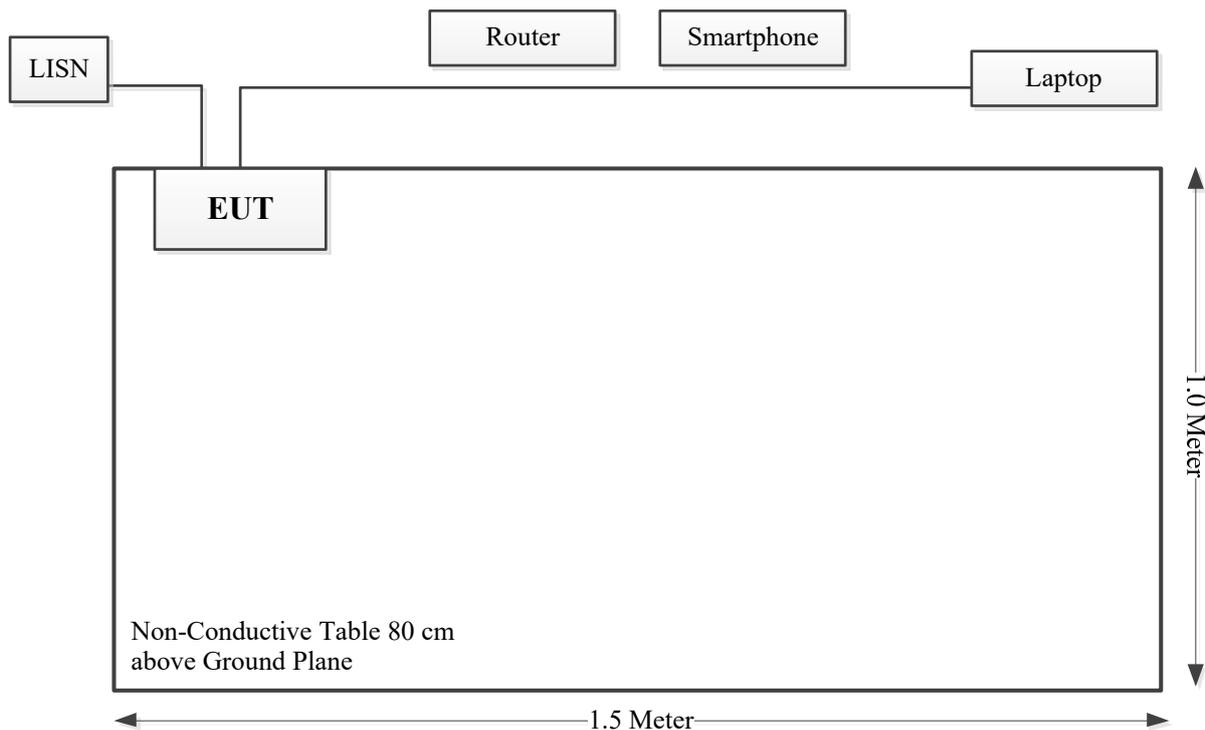
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	E6410	G4JJPM1
Lenovo	Laptop	T430	00331-10000-00001-AA887_02
Epik	Smartphone	K500	SZ180322001SA

Support Cable List and Details

Cable Description	Shielding Cable	Ferrite Core	Length (m)	From Port	To
RJ45 Cable	Yes	No	10	EUT	Laptop

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	2022/11/18	2023/11/17
TESEQ	ISN	T800	34379	2022/11/22	2023/11/21
R&S	EMI Test Receiver	ESCI	100035	2022/10/24	2023/10/23
MICRO-COAX	Coaxial Cable	C-NJNJ-50	C-0200-01	2022/9/5	2023/9/4
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	2023/11/9
R&S	EMI Test Receiver	ESR3	102453	2022/11/18	2023/11/17
Unknown	Coaxial Cable	C-NJNJ-50	C-0075-01	2022/7/19	2023/7/18
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-01	2022/7/19	2023/7/18
Unknown	Coaxial Cable	C-NJNJ-50	C-1400-01	2022/7/19	2023/7/18
Sonoma	Amplifier	310N	372193	2022/7/18	2023/7/17
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	2022/7/15	2023/7/14
Unknown	Coaxial Cable	C-SJSJ-50	C-0800-01	2022/9/4	2023/9/3
AH	Preamplifier	PAM-0118	469	2022/10/13	2023/10/12
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Sinoscite	Bandstop Filters	BSF5150-5850MN -0899-003	0899003	2022/5/6	2023/5/5
E-Microwave	Band-stop Filters	OBSF-2400-2483. 5-S	OE01601525	2022/6/16	2023/6/15
Flicker					
EVERFINE	Harmonic & Flicker TEST ING Power Source	HFS-4000	P624486CD1411 122	2022/11/22	2023/11/21
EVERFINE	Harmonic & Flicker Measurement System	HFM3000	P630850CD1411 115	2022/11/16	2023/11/15
CS					
HP	Signal Generator	8648A	3246A00831	2022/11/22	2023/11/21
R&S	Power Amplifier	15A250	12934	N/A	N/A
Werlatone	Dual Directional Coupler	C5091-10	113192	2023/2/9	2024/2/8
HP	Power Meter	HP EPM-441A	GB37481494	2022/11/18	2023/11/17
Agilent	8482A Power sensor	8482A	US37296108	2022/11/18	2023/11/17
NARDA	Attenuator	769-6	2754	N/A	N/A
COM-POWER	CDN	M325E	521064	2022/11/22	2023/11/21
COM-POWER	CDN	T8E	581607	2022/7/15	2023/7/14
EFT & Surge & Dips					
EM TEST	Ultra Compact Generator	UCS 500N5	P1406130994	2022/11/22	2023/11/21
EM TEST	Autotransformer	MV2616	P1450144859	N/A	N/A
EM TEST	CDN	CNV508 S1	311137	2022/11/22	2023/11/21
EM TEST	EFT Clamp	N/A	300886	2022/7/15	2023/7/14
ESD					
HAEFELY	Electrostatic Discharge Simulator	ONYX	180786	2022/11/16	2023/11/15

RS					
AR	Antenna	ATL80M1G	0351400	N/A	N/A
AR	Antenna	ATT700M12G	0349410	N/A	N/A
HP	Signal Generator	8665B	3438a00584	2022/11/18	2023/11/17
AR	Power Amplifier	500W1000C	0353561	N/A	N/A
AR	Power Amplifier	60S1G6	0348711	N/A	N/A
PASTERNAK	Dual Directional Coupler	PE2239-30	1711	2022/7/15	2023/7/14
Agilent	EPM Series Power Meter	E4419B	MY45103907	2022/11/18	2023/11/17
Agilent	E-Series Avg Power Sensor	E9301A	MY41497625	2022/11/22	2023/11/21
Agilent	E-Series Avg Power Sensor	E9301A	MY41497628	2022/11/22	2023/11/21

* 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:	21.0°C	20.1°C	21.8°C	22.4~22.8°C
Relative Humidity:	57%	63%	42%	44~49%
ATM Pressure:	101.2kPa	102.3kPa	101.7kPa	102.4kPa
Tester:	Walker Chen	Colin Yang	Lucky Lu	Lane Sun
Test Date:	2023/2/18	2023/2/17	2023/2/22	2023/3/2

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.

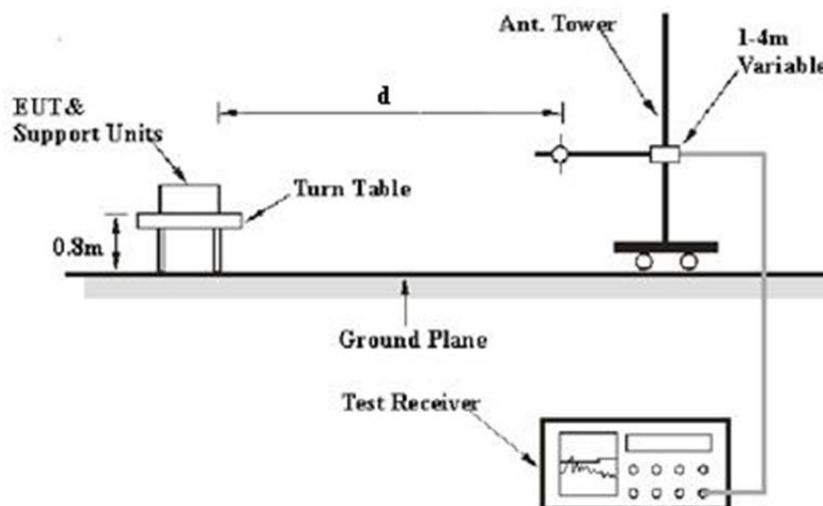
Based on CISPR 16-4-2: 2011*, measurement uncertainty of radiated emission at a distance of 10m at Bay Area Compliance Laboratories Corp. (Dongguan) is:30M~200MHz: 4.55 dB for Horizontal, 4.57 dB for Vertical; 200M~1GHz: 4.66 dB for Horizontal, 4.56 dB for Vertical; measurement uncertainty of radiated 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}

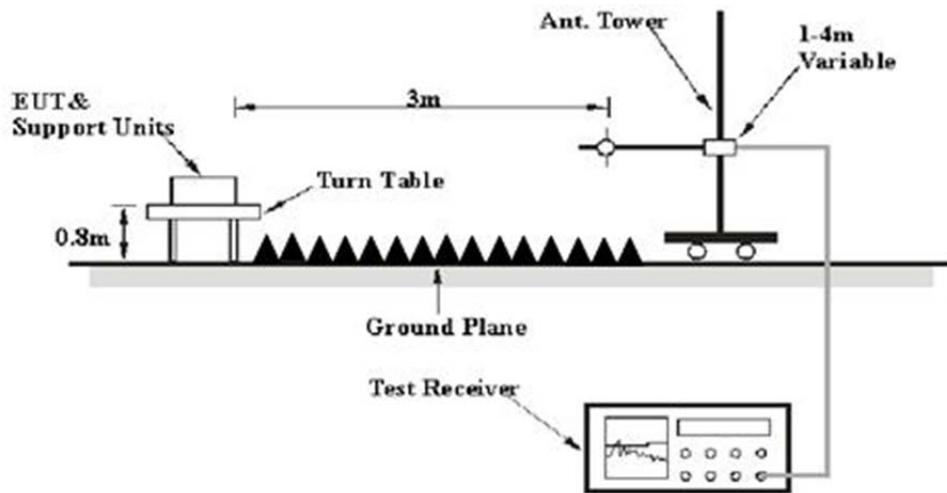
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC)(30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR)(1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR)(6 GHz to 18 GHz)	5.5 dB

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 40cm long in the middle. The spacing between the peripherals was 10cm.

EMI Test Receiver and Spectrum Analyzer Setup

The system was investigated from 30 MHz to 6 GHz.

During the radiated emission test, the EMI test receiver(Below 1GHz) and Spectrum Analyzer(Above 1GHz) were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30MHz - 1000 MHz	120 kHz	300 kHz	120kHz	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 1GHz.

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 = Limit-Result

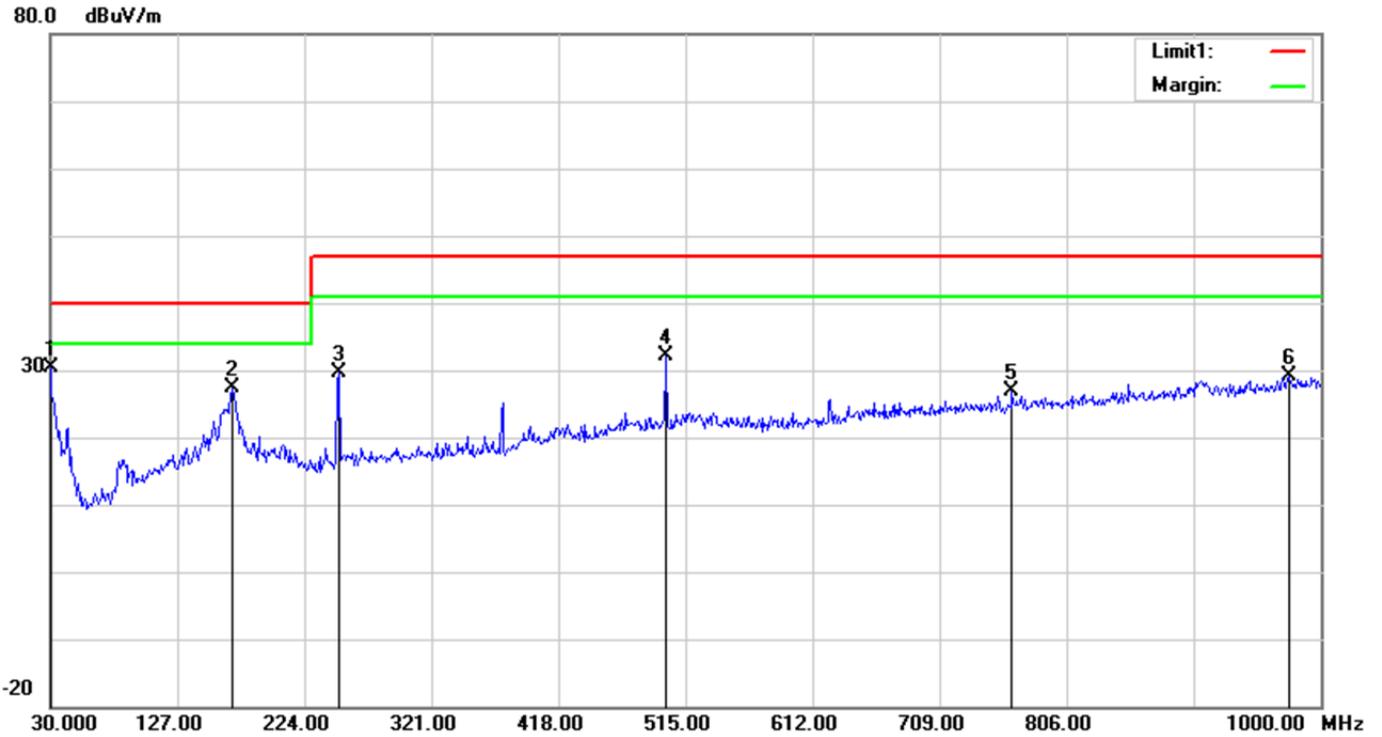
Test Data

Please refer to following table and plots:

Below 1G

Condition: EN 301 489 Class B 3m Radiation
Test Mode: M1
Note:

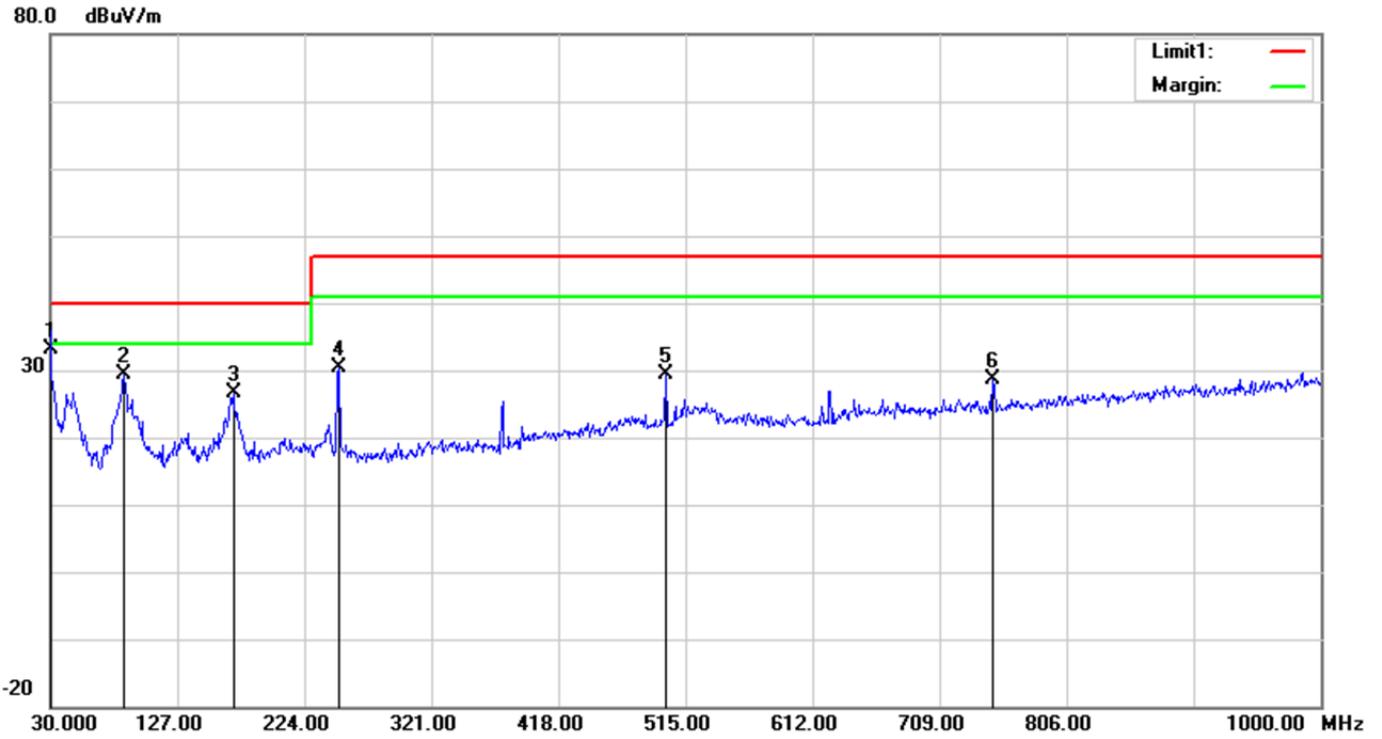
Polarization: Horizontal
Distance: 3m
Power: AC 230V/50Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	30.0000	33.76	peak	-3.34	30.42	40.00	9.58
2	168.7100	40.01	peak	-12.68	27.33	40.00	12.67
3	250.1900	41.90	peak	-12.23	29.67	47.00	17.33
4	500.4500	37.62	peak	-5.50	32.12	47.00	14.88
5	764.2900	28.48	peak	-1.66	26.82	47.00	20.18
6	975.7500	26.98	peak	2.15	29.13	47.00	17.87

Condition: EN 301 489 Class B 3m Radiation
Test Mode: M1
Note:

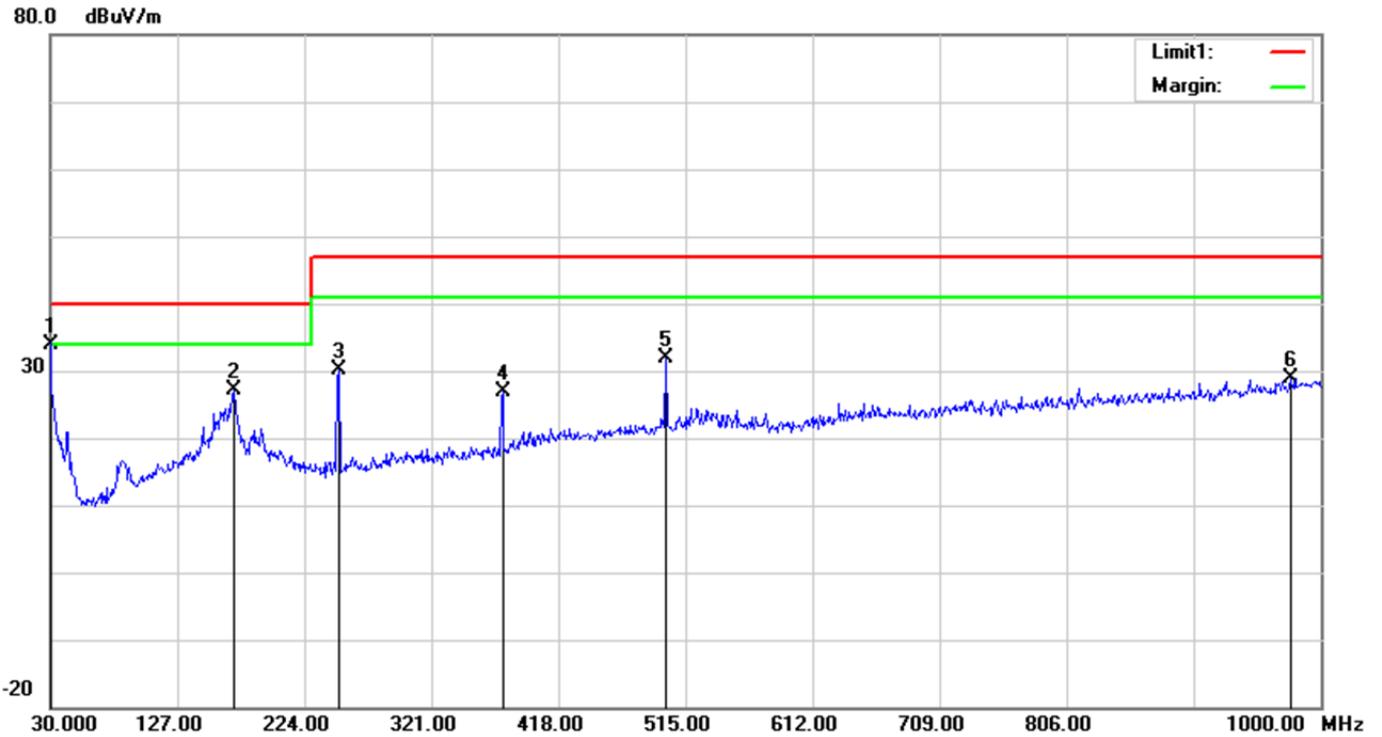
Polarization: Vertical
Distance: 3m
Power: AC 230V/50Hz



No.	Frequency (MHz)	Reading (dBμV)	Detector	Corrected (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1	30.0000	36.42	QP	-3.34	33.08	40.00	6.92
2	86.2600	46.06	peak	-16.69	29.37	40.00	10.63
3	169.6800	39.25	peak	-12.74	26.51	40.00	13.49
4	250.1900	42.72	peak	-12.23	30.49	47.00	16.51
5	499.4800	34.96	peak	-5.52	29.44	47.00	17.56
6	749.7400	30.54	peak	-2.00	28.54	47.00	18.46

Condition: EN 301 489 Class B 3m Radiation
Test Mode: M1
Note:

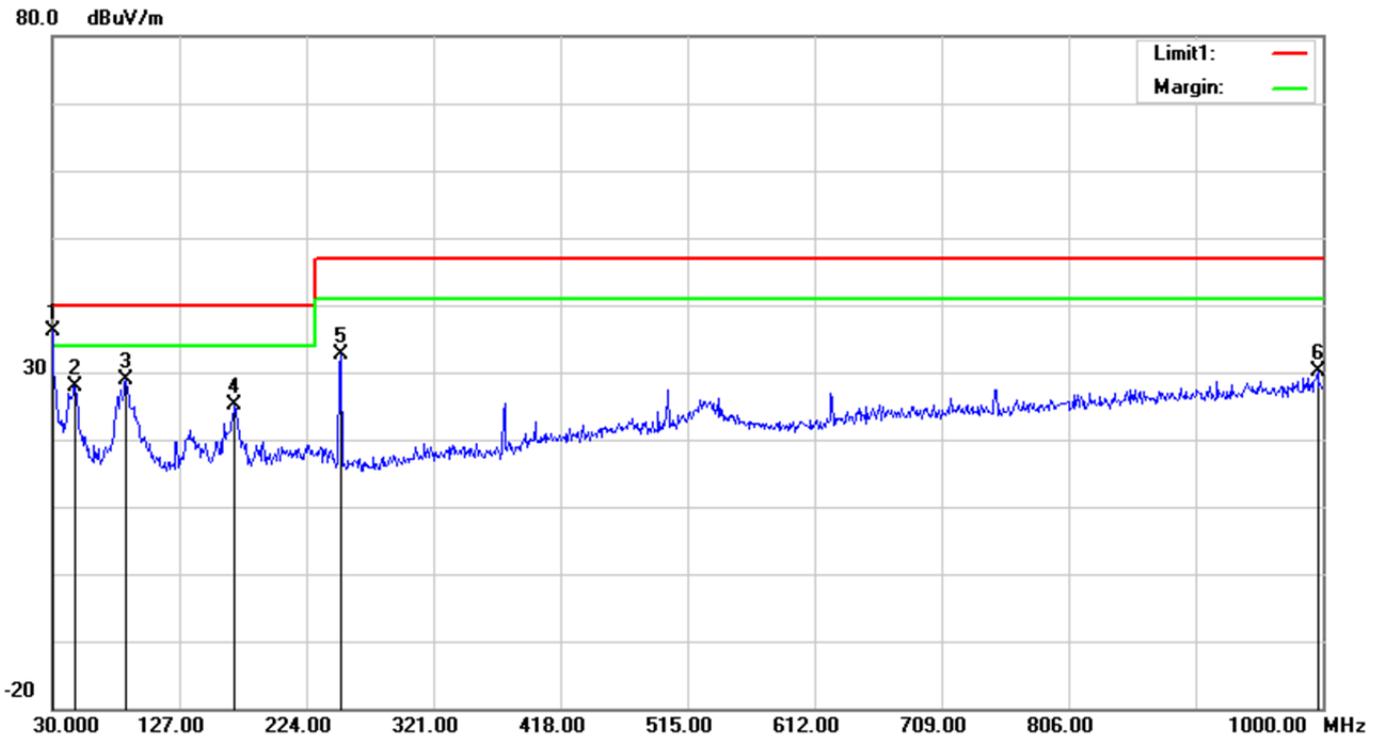
Polarization: Horizontal
Distance: 3m
Power: AC 110V/60Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	30.0000	37.34	peak	-3.34	34.00	40.00	6.00
2	170.6500	39.80	peak	-12.78	27.02	40.00	12.98
3	250.1900	42.44	peak	-12.23	30.21	47.00	16.79
4	375.3200	35.91	peak	-8.92	26.99	47.00	20.01
5	500.4500	37.46	peak	-5.50	31.96	47.00	15.04
6	976.7200	26.76	peak	2.19	28.95	47.00	18.05

Condition: EN 301 489 Class B 3m Radiation
Test Mode: M1
Note:

Polarization: Vertical
Distance: 3m
Power: AC 110V/60Hz

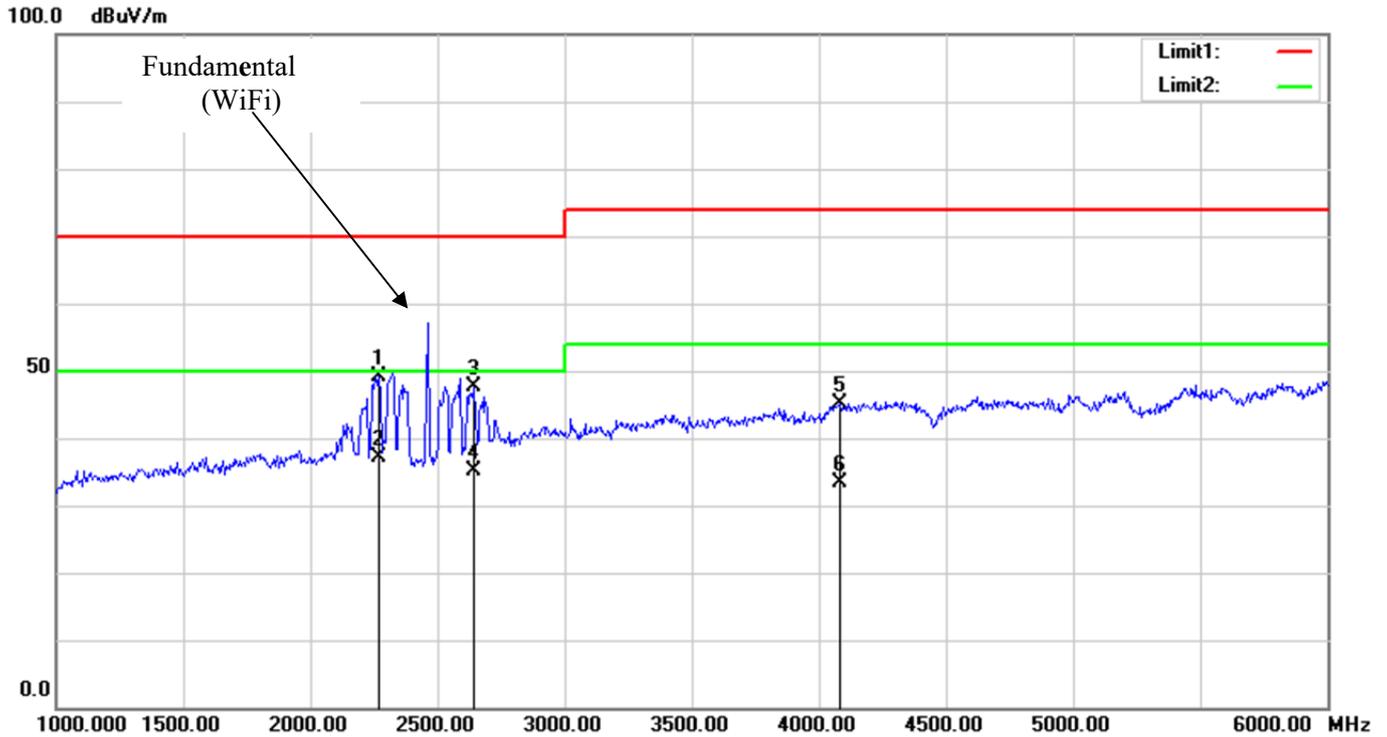


No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	30.0000	39.43	peak	-3.34	36.09	40.00	3.91
2	47.4600	43.09	peak	-15.10	27.99	40.00	12.01
3	86.2600	45.46	peak	-16.69	28.77	40.00	11.23
4	168.7100	37.77	peak	-12.68	25.09	40.00	14.91
5	250.1900	44.75	peak	-12.23	32.52	47.00	14.48
6	996.1200	27.52	peak	2.51	30.03	47.00	16.97

Above 1G

Condition: EN 301 489 Class B
Test Mode: M1
Note:

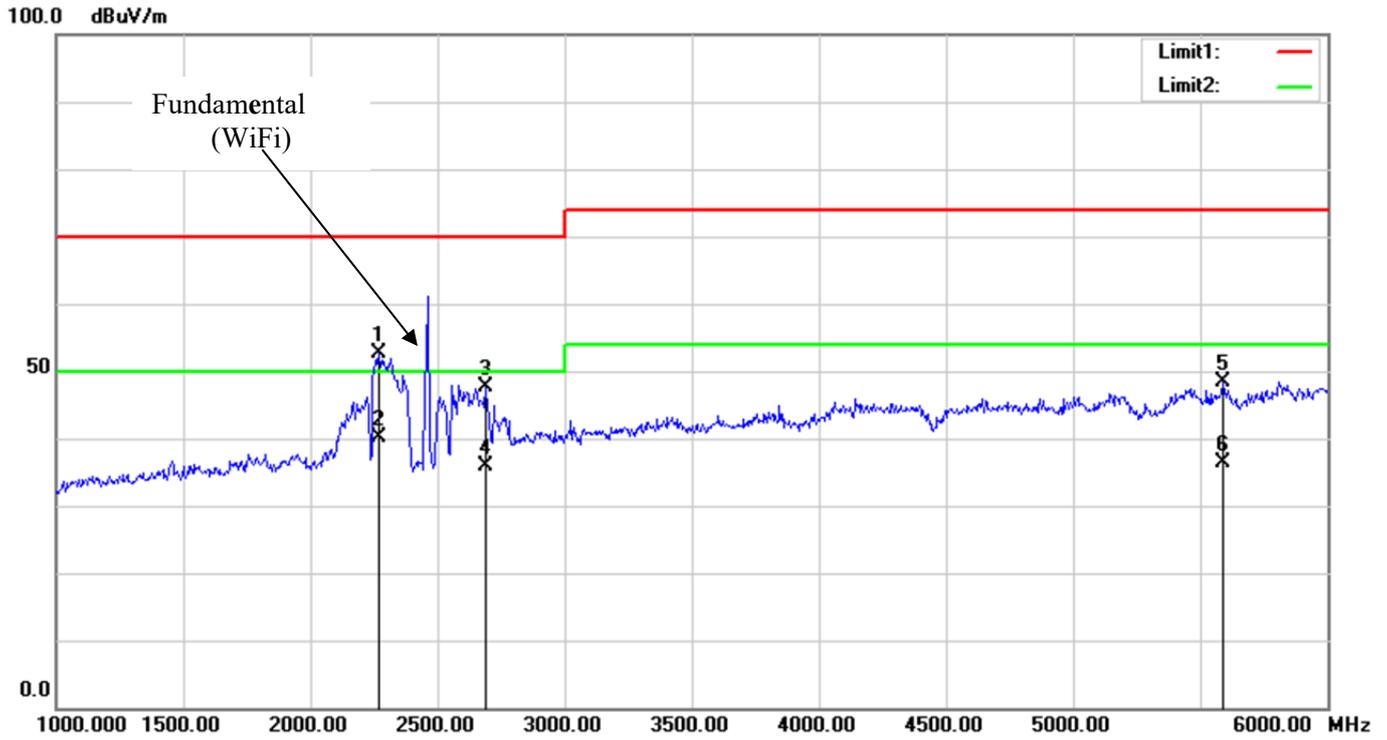
Polarization: Horizontal
Distance: 3m
Power: AC 230V/50Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dB μ V)		(dB/m)	(dB μ V/m)	(dB μ V/m)	(dB)
1	2270.000	59.32	peak	-10.14	49.18	70.00	20.82
2	2270.000	47.23	AVG	-10.14	37.09	50.00	12.91
3	2647.500	56.81	peak	-9.15	47.66	70.00	22.34
4	2647.500	44.20	AVG	-9.15	35.05	50.00	14.95
5	4087.500	49.05	peak	-3.98	45.07	74.00	28.93
6	4087.500	37.25	AVG	-3.98	33.27	54.00	20.73

Condition: EN 301 489 Class B
Test Mode: M1
Note:

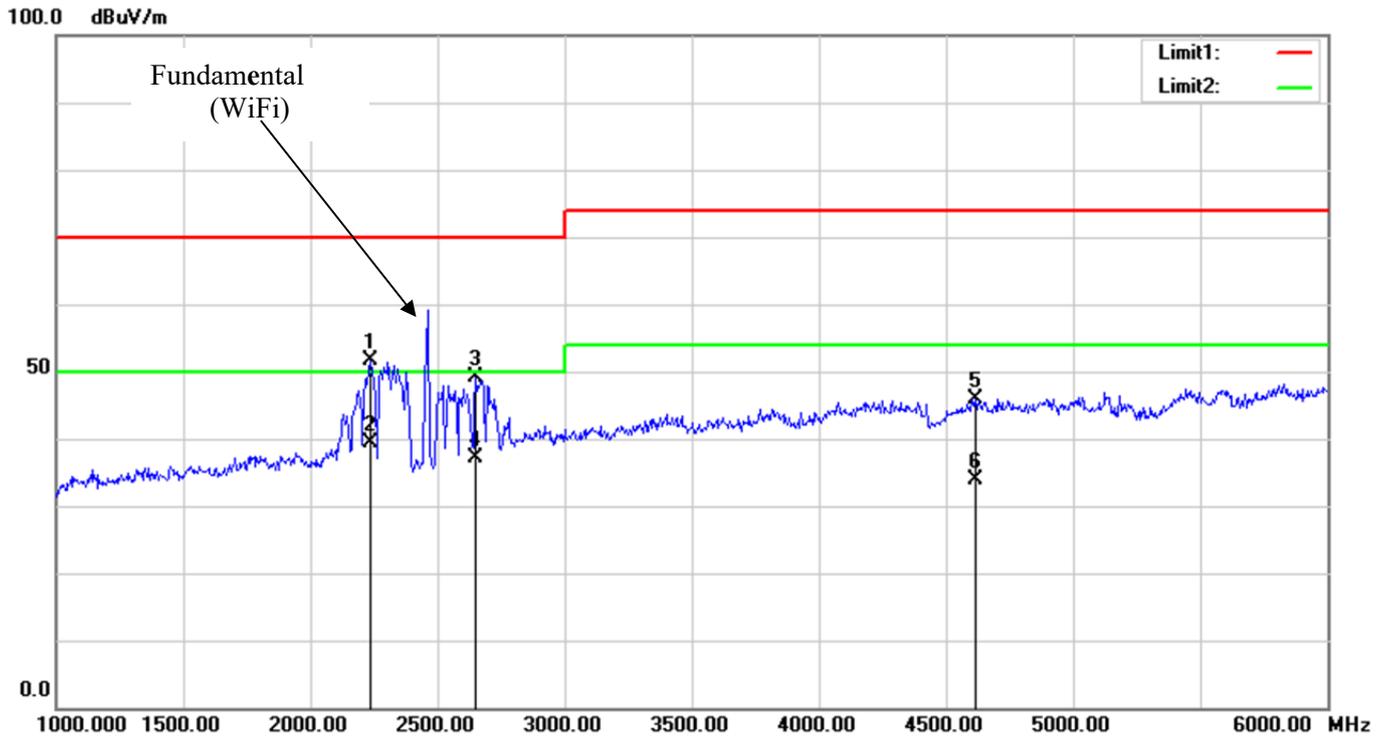
Polarization: Vertical
Distance: 3m
Power: AC 230V/50Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	2272.500	62.88	peak	-10.14	52.74	70.00	17.26
2	2272.500	50.22	AVG	-10.14	40.08	50.00	9.92
3	2690.000	56.50	peak	-8.93	47.57	70.00	22.43
4	2690.000	44.71	AVG	-8.93	35.78	50.00	14.22
5	5592.500	49.51	peak	-1.25	48.26	74.00	25.74
6	5592.500	37.62	AVG	-1.25	36.37	54.00	17.63

Condition: EN 301 489 Class B
Test Mode: M1
Note:

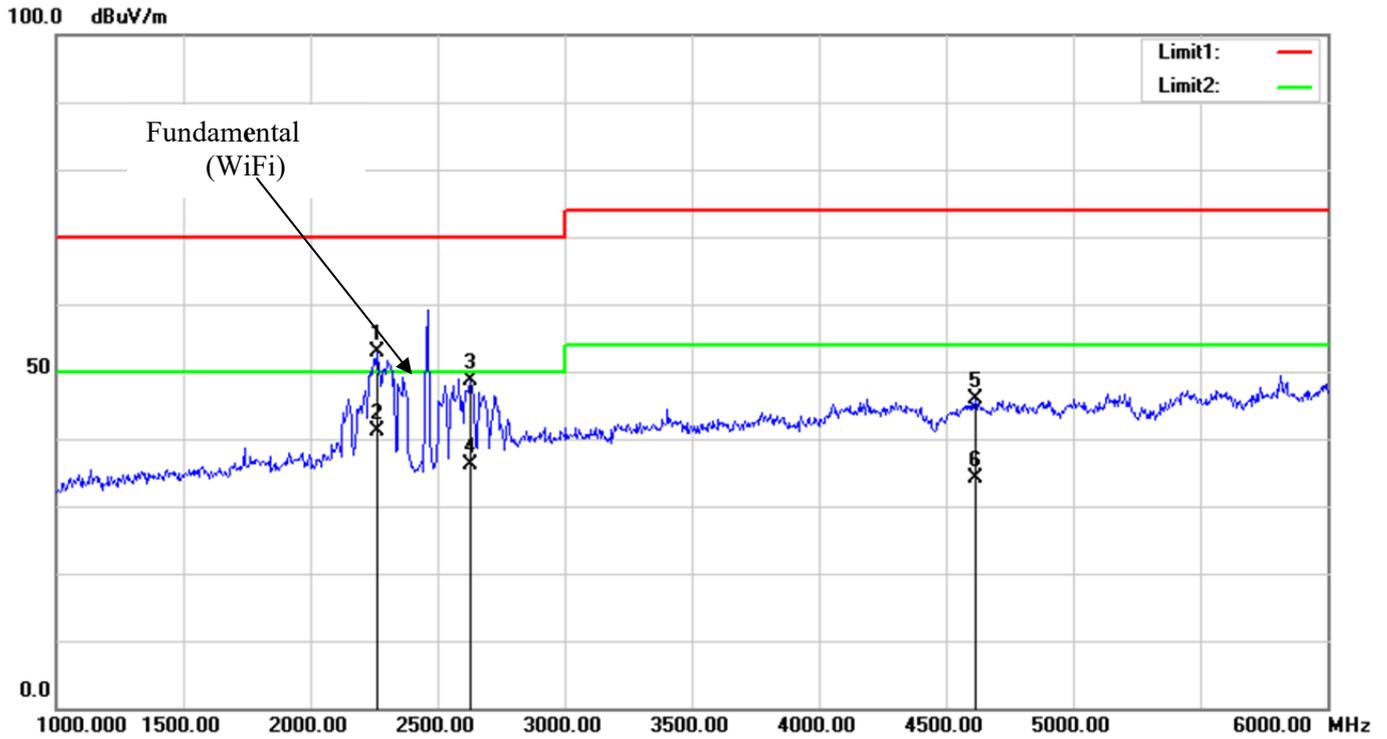
Polarization: Horizontal
Distance: 3m
Power: AC 110V/60Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	2235.000	61.91	peak	-10.33	51.58	70.00	18.42
2	2235.000	49.65	AVG	-10.33	39.32	50.00	10.68
3	2652.500	58.33	peak	-9.13	49.20	70.00	20.80
4	2652.500	46.22	AVG	-9.13	37.09	50.00	12.91
5	4617.500	49.75	peak	-3.81	45.94	74.00	28.06
6	4617.500	37.58	AVG	-3.81	33.77	54.00	20.23

Condition: EN 301 489 Class B
Test Mode: M1
Note:

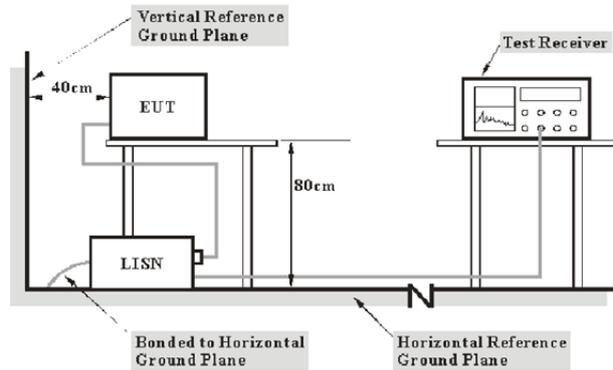
Polarization: Vertical
Distance: 3m
Power: AC 110V/60Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	2260.000	63.03	peak	-10.14	52.89	70.00	17.11
2	2260.000	51.36	AVG	-10.14	41.22	50.00	8.78
3	2632.500	57.72	peak	-9.20	48.52	70.00	21.48
4	2632.500	45.39	AVG	-9.20	36.19	50.00	13.81
5	4615.000	49.73	peak	-3.81	45.92	74.00	28.08
6	4615.000	37.92	AVG	-3.81	34.11	54.00	19.89

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 40cm long in the middle.

The spacing between the peripherals was 10cm.

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 30MHz.

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:

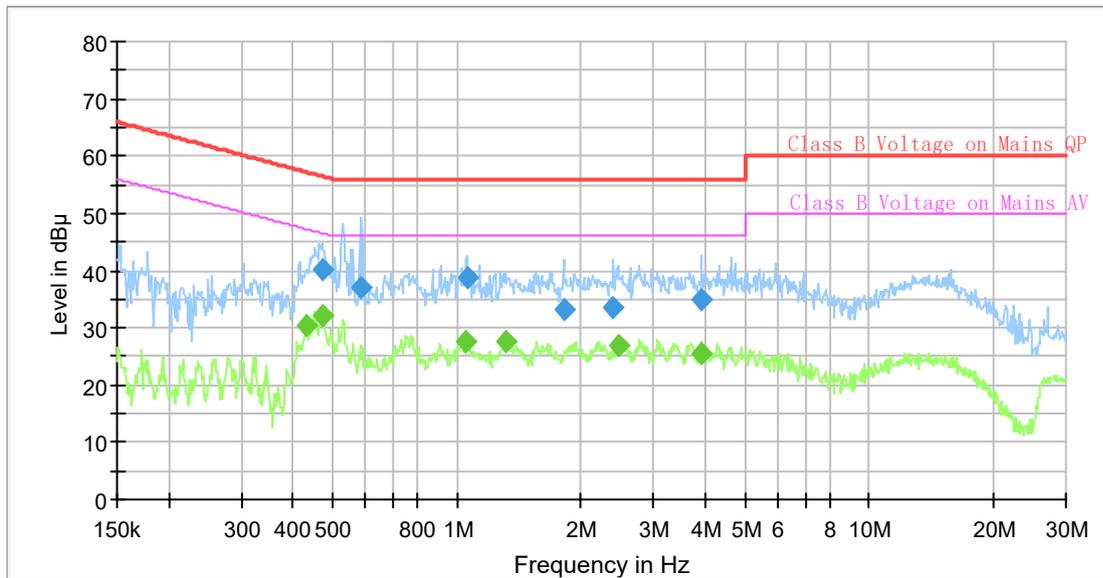
Corr. = Cable loss + Factor of coupling device

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:

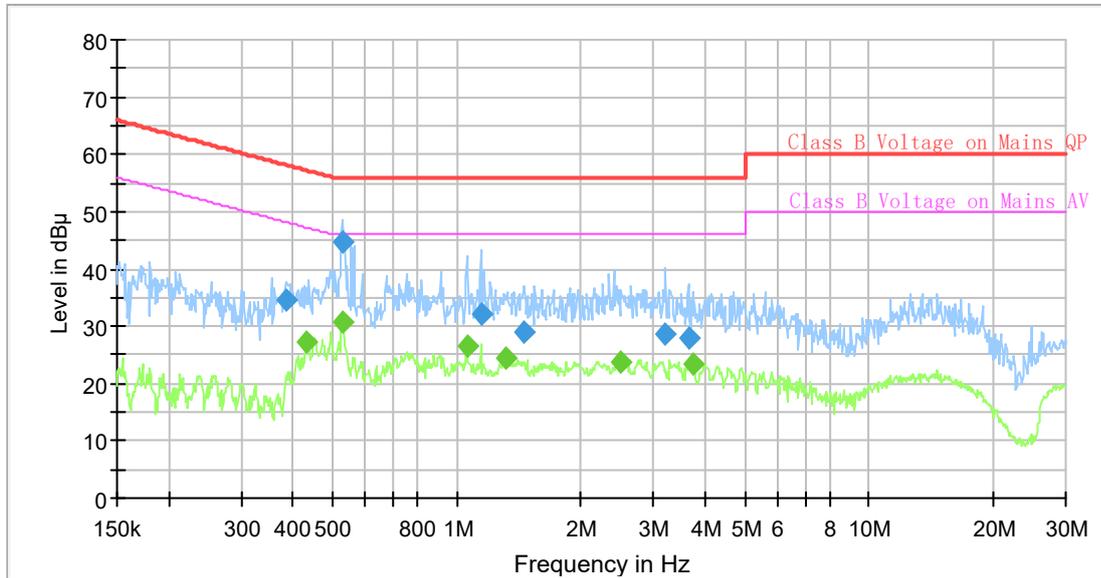
Port: L
 Test Mode: Operating
 Power Source: AC 110V/60Hz
 Note:



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.431814	---	30.32	47.22	16.90	9.000	L1	9.6
0.470023	40.29	---	56.51	16.22	9.000	L1	9.6
0.472373	---	32.04	46.47	14.43	9.000	L1	9.6
0.588291	37.03	---	56.00	18.97	9.000	L1	9.6
1.054439	---	27.75	46.00	18.25	9.000	L1	9.7
1.059711	38.85	---	56.00	17.15	9.000	L1	9.7
1.313192	---	27.52	46.00	18.48	9.000	L1	9.7
1.816026	33.15	---	56.00	22.85	9.000	L1	9.7
2.389217	33.70	---	56.00	22.30	9.000	L1	9.7
2.461795	---	26.77	46.00	19.23	9.000	L1	9.7
3.914674	34.84	---	56.00	21.16	9.000	L1	9.7
3.914674	---	25.58	46.00	20.42	9.000	L1	9.7

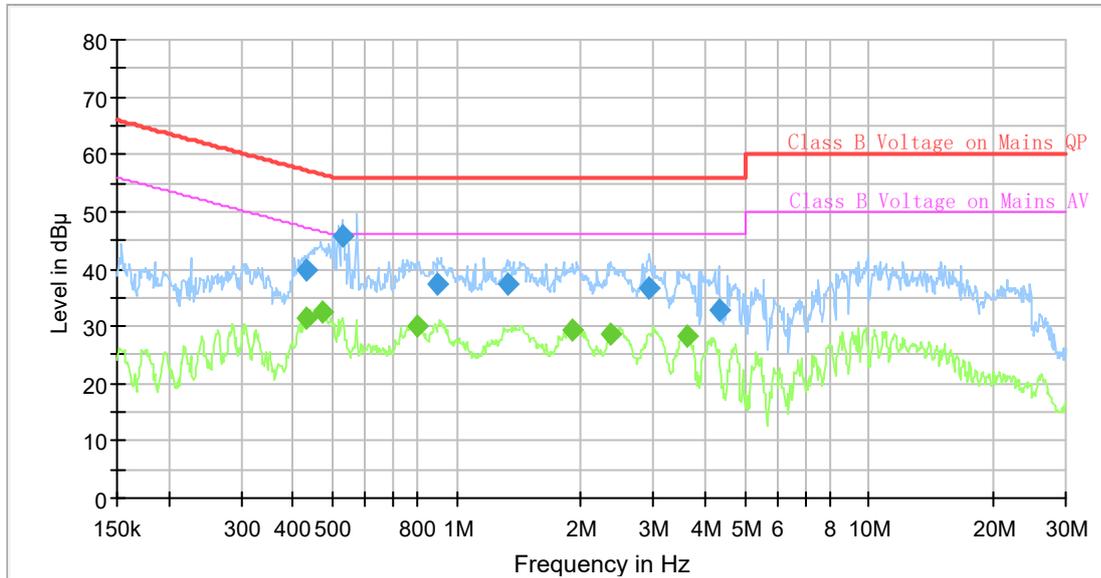
Port: N
 Test Mode: Operating
 Power Source: AC 110V/60Hz
 Note:



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.386939	34.42	---	58.13	23.71	9.000	N	9.6
0.429665	---	27.24	47.26	20.02	9.000	N	9.6
0.527156	44.82	---	56.00	11.18	9.000	N	9.6
0.529791	---	30.91	46.00	15.09	9.000	N	9.6
1.059711	---	26.51	46.00	19.49	9.000	N	9.6
1.147742	32.14	---	56.00	23.86	9.000	N	9.6
1.313192	---	24.46	46.00	21.54	9.000	N	9.6
1.458194	29.05	---	56.00	26.95	9.000	N	9.6
2.498907	---	23.67	46.00	22.33	9.000	N	9.6
3.206662	28.48	---	56.00	27.52	9.000	N	9.6
3.650655	28.03	---	56.00	27.97	9.000	N	9.6
3.724217	---	23.28	46.00	22.72	9.000	N	9.6

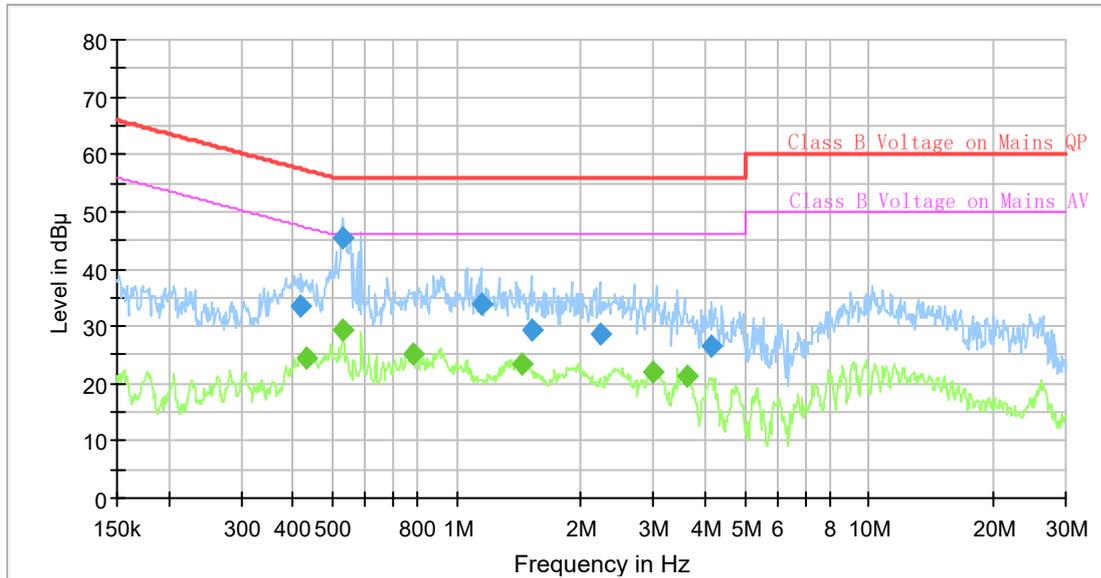
Port: L
 Test Mode: Operating
 Power Source: AC 230V/50Hz
 Note:



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.431814	40.00	---	57.22	17.22	9.000	L1	9.6
0.431814	---	31.47	47.22	15.75	9.000	L1	9.6
0.474735	---	32.46	46.43	13.97	9.000	L1	9.6
0.527156	45.87	---	56.00	10.13	9.000	L1	9.6
0.797484	---	30.12	46.00	15.88	9.000	L1	9.7
0.898892	37.54	---	56.00	18.46	9.000	L1	9.7
1.326356	37.35	---	56.00	18.65	9.000	L1	9.7
1.899401	---	29.35	46.00	16.65	9.000	L1	9.7
2.365502	---	28.48	46.00	17.52	9.000	L1	9.7
2.931326	36.63	---	56.00	19.37	9.000	L1	9.7
3.632492	---	28.35	46.00	17.65	9.000	L1	9.7
4.325306	32.90	---	56.00	23.10	9.000	L1	9.7

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

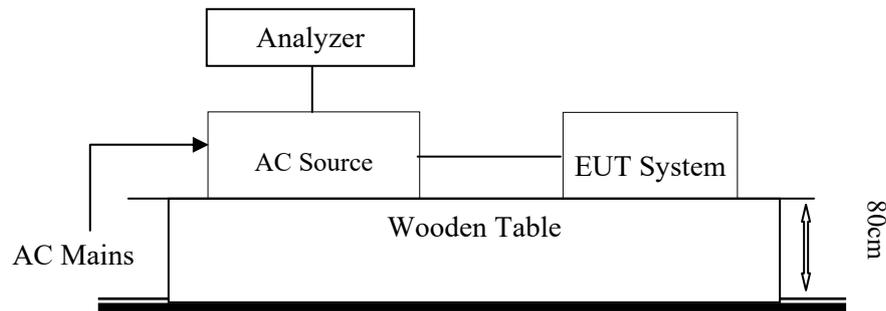


Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.419083	33.59	---	57.47	23.88	9.000	N	9.6
0.431814	---	24.60	47.22	22.62	9.000	N	9.6
0.529791	---	29.27	46.00	16.73	9.000	N	9.6
0.529791	45.56	---	56.00	10.44	9.000	N	9.6
0.781732	---	25.18	46.00	20.82	9.000	N	9.6
1.147742	33.75	---	56.00	22.25	9.000	N	9.6
1.436538	---	23.48	46.00	22.52	9.000	N	9.6
1.517553	29.44	---	56.00	26.56	9.000	N	9.6
2.228079	28.58	---	56.00	27.42	9.000	N	9.6
2.990393	---	22.14	46.00	23.86	9.000	N	9.6
3.614420	---	21.43	46.00	24.57	9.000	N	9.6
4.156123	26.44	---	56.00	29.56	9.000	N	9.6

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

Test System Setup



Test Standard

EN 61000-3-3:2013+A1:2019+A2:2021

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 a delayed 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 a 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:

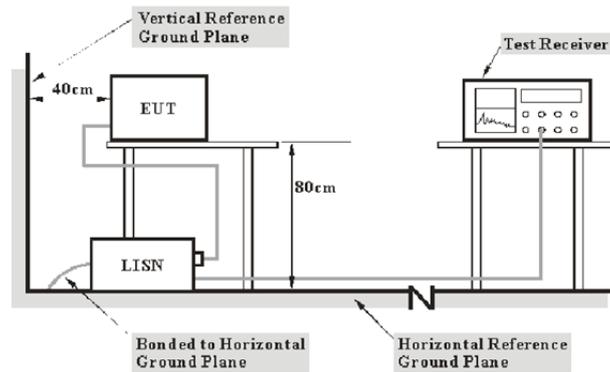
Short time (Pst): 10 min
Observation time: 120 min (12 Flicker measurement)
Test Mode: M1: operating
Power Source: AC 230V/50Hz
Test Result: PASS

Maximum Flicker results

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.008	3.30	PASS
dmax [%]	0.231	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 30 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 40cm long in the middle.

The spacing between the peripherals was 10cm.

EMI Test Receiver Setup

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

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:

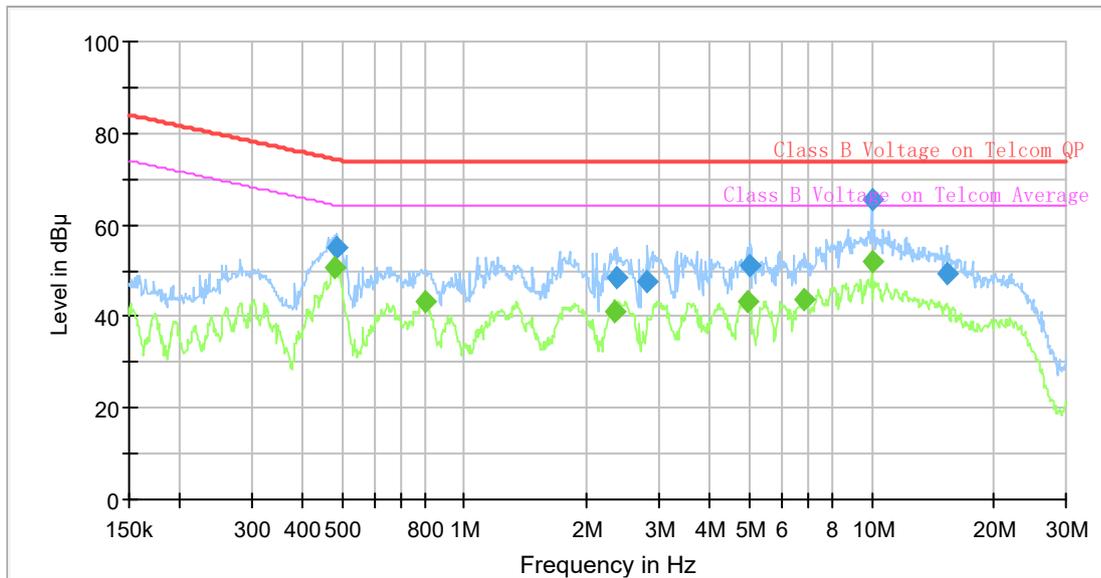
Corr. = Cable loss + Factor of coupling device

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:

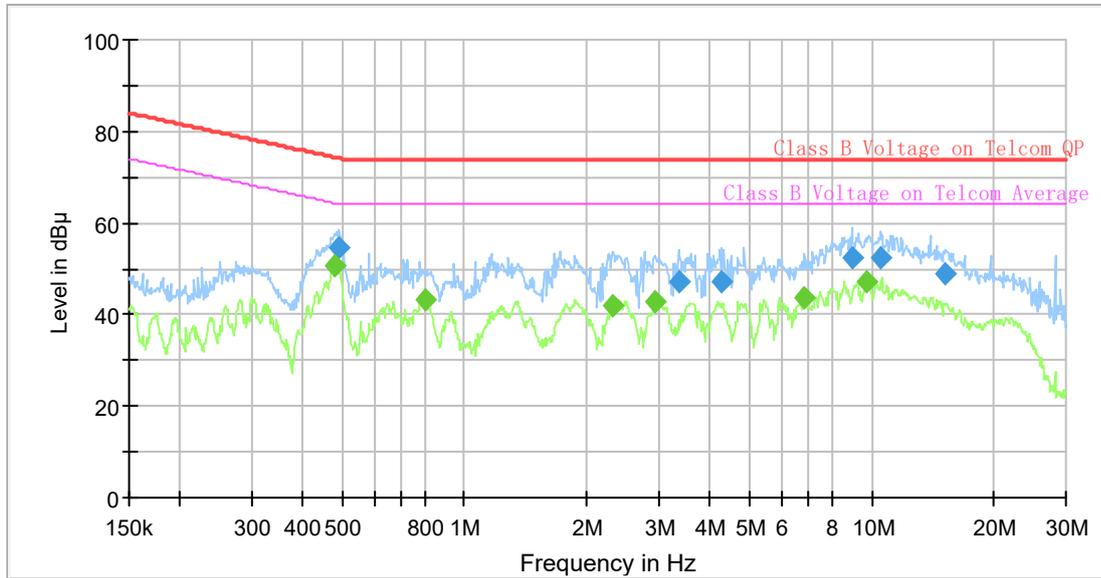
Port: RJ45
 Test Mode: 10Mbps
 Power Source: AC 230V/50Hz
 Note:



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.477109	---	50.82	64.39	13.57	9.000	Signal	9.8
0.486723	54.88	---	74.22	19.34	9.000	Signal	9.8
0.797484	---	43.28	64.00	20.72	9.000	Signal	9.7
2.330372	---	41.22	64.00	22.78	9.000	Signal	9.6
2.377330	48.63	---	74.00	25.37	9.000	Signal	9.6
2.816667	47.47	---	74.00	26.53	9.000	Signal	9.6
4.948807	---	43.08	64.00	20.92	9.000	Signal	9.6
5.023411	51.16	---	74.00	22.84	9.000	Signal	9.6
6.843757	---	43.78	64.00	20.22	9.000	Signal	9.6
9.998049	65.63	---	74.00	8.37	9.000	Signal	9.6
9.998049	---	52.08	64.00	11.92	9.000	Signal	9.6
15.276734	49.39	---	74.00	24.61	9.000	Signal	9.6

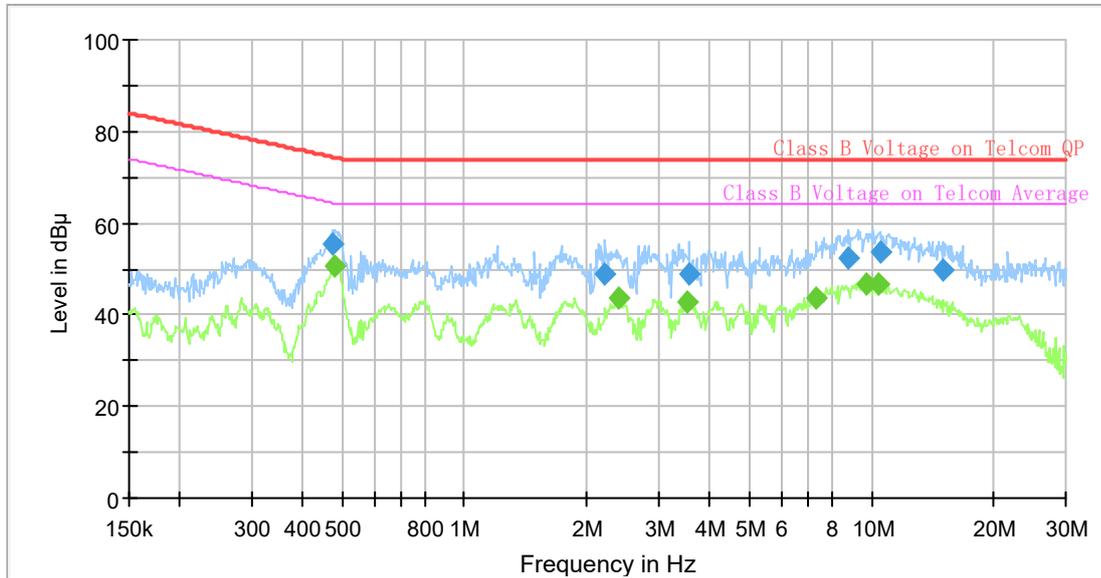
Port: RJ45
 Test Mode: 100Mbps
 Power Source: AC 230V/50Hz
 Note:



Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.477109	---	50.45	64.39	13.94	9.000	Signal	9.8
0.491602	54.37	---	74.14	19.77	9.000	Signal	9.8
0.797484	---	43.11	64.00	20.89	9.000	Signal	9.7
2.307242	---	41.77	64.00	22.23	9.000	Signal	9.6
2.931326	---	42.73	64.00	21.27	9.000	Signal	9.6
3.353882	47.01	---	74.00	26.99	9.000	Signal	9.6
4.282376	47.37	---	74.00	26.63	9.000	Signal	9.6
6.843757	---	43.46	64.00	20.54	9.000	Signal	9.6
8.959049	52.27	---	74.00	21.73	9.000	Signal	9.6
9.751804	---	47.02	64.00	16.98	9.000	Signal	9.6
10.509350	52.24	---	74.00	21.76	9.000	Signal	9.6
15.200730	49.10	---	74.00	24.90	9.000	Signal	9.6

Port: RJ45
 Test Mode: 1000Mbps
 Power Source: AC 230V/50Hz
 Note:

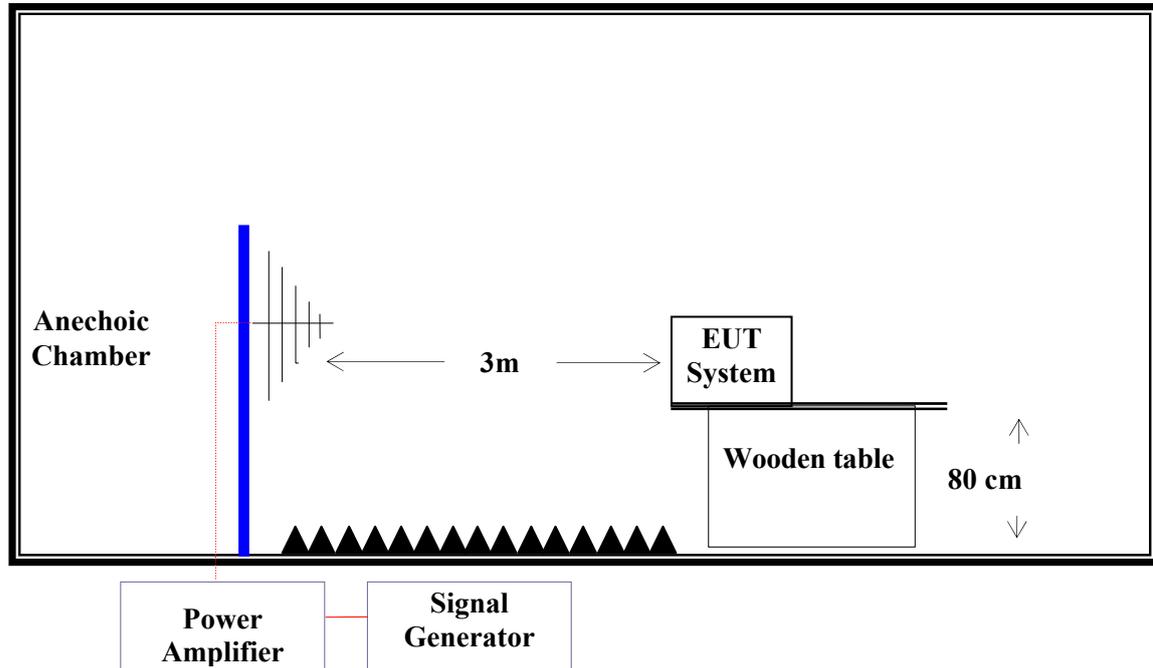


Final Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.474735	55.33	---	74.43	19.10	9.000	Signal	9.8
0.479495	---	50.67	64.35	13.68	9.000	Signal	9.8
2.216994	48.91	---	74.00	25.09	9.000	Signal	9.6
2.389217	---	43.80	64.00	20.20	9.000	Signal	9.6
3.525400	---	42.67	64.00	21.33	9.000	Signal	9.6
3.560742	48.70	---	74.00	25.30	9.000	Signal	9.6
7.265865	---	43.69	64.00	20.31	9.000	Signal	9.6
8.782085	52.35	---	74.00	21.65	9.000	Signal	9.6
9.703287	---	46.81	64.00	17.19	9.000	Signal	9.6
10.405040	---	46.76	64.00	17.24	9.000	Signal	9.6
10.457065	53.69	---	74.00	20.31	9.000	Signal	9.6
15.049855	49.62	---	74.00	24.38	9.000	Signal	9.6

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:

- 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.
- 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.
- 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.
- 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 this antenna and measured individually.

In order to judge the EUT performance, a CCD camera, Laptop and Smartphone were used to monitor the EUT.

Test Data

Please refer to following tables:

Test Mode: M1: operating

Note:

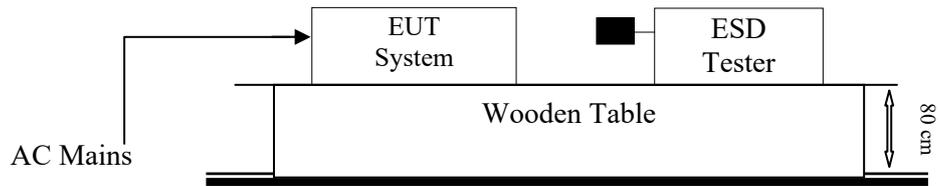
Condition of Test	Remarks
Field Strength	3 V/m (Test Level 2)
RF Signal	1 kHz, 80% AM, sine wave
Sweep Frequency Step	1%, logarithmic
Dwell Time	1 Sec

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

EN61000-4-2 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: M1: 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	/	/
RJ45 Port	A	A	A	A	A	A	/	/
Antenna	A	A	A	A	A	A	/	/
Button	A	A	A	A	A	A	/	/
Seam	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
/	/	/	/	/	/	/	/	/

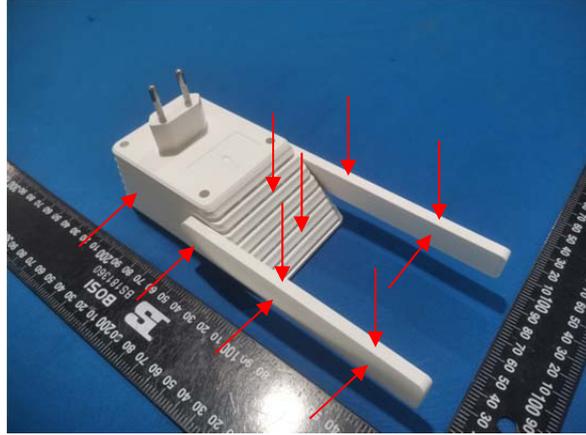
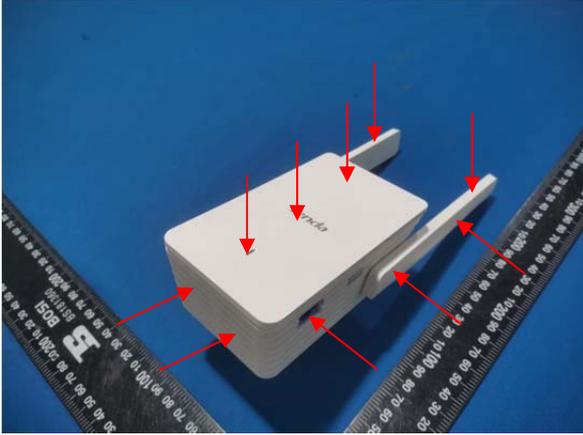
Table 3: Electrostatic Discharge Immunity (Indirect Contact HCP)

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

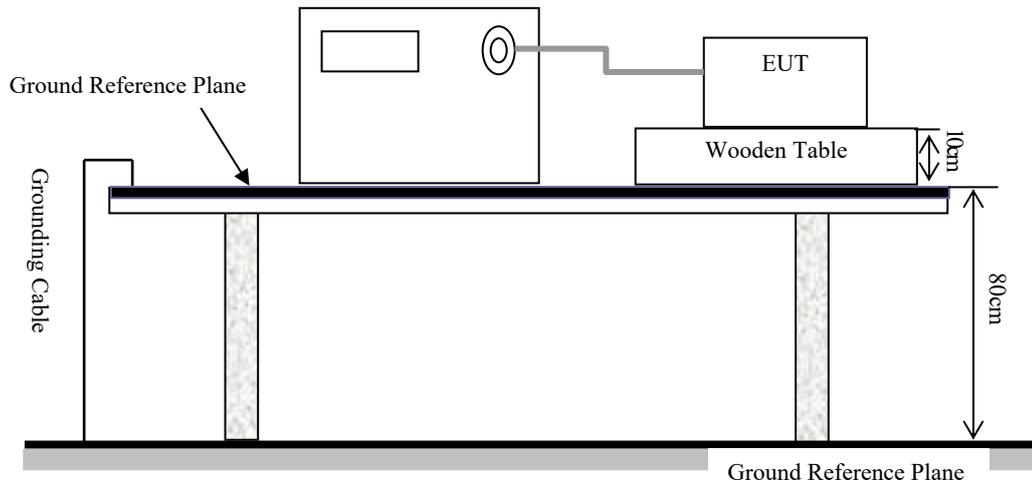


Air Discharge: 

Direct Contact: 

9 - FAST TRANSIENTS, COMMON MODE

Test System Setup



Test Level

Open Circuit Output Test Voltage $\pm 10\%$		
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

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:

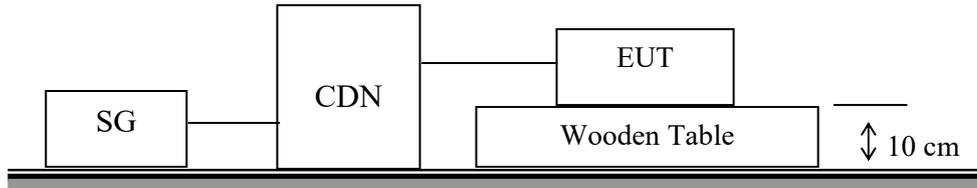
Test Mode: M1: operating

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

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 operating situation during compliance testing and decide the EUT immunity criterion.

Test Data

Please refer to following tables:

Test Mode: M1: operating

Note:

Table 1: AC mains power input port

Frequency range: 150kHz to 80MHz

Modulated: Amplitude 80%, 1kHz sine wave
 Unmodulated
 Other:
 Severity Level: 3V 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

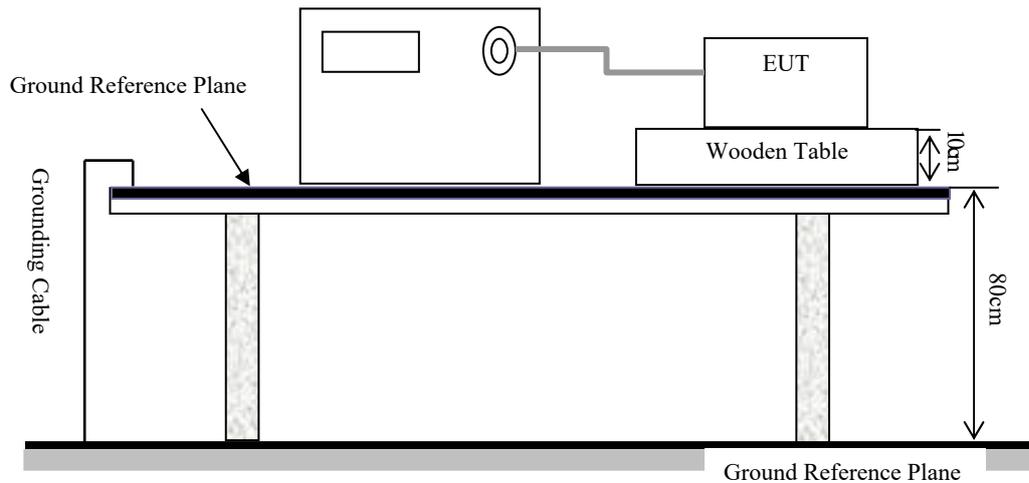
Frequency range: 150 kHz to 80MHz

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	/	/

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: M1: operating

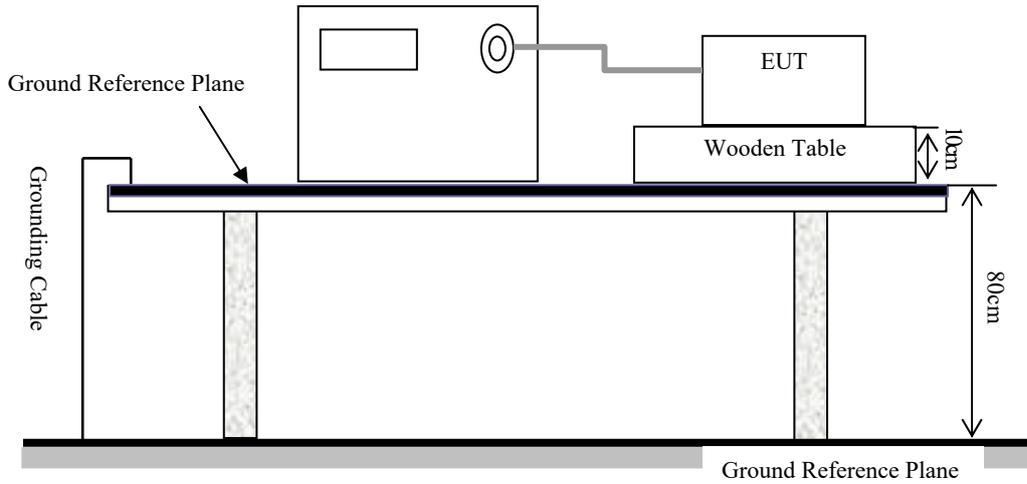
B indicates that the power supply of the EUT was interrupted during the test, and the EUT was restarted. After the test, it can automatically return to normal use.

Table 1: Voltage Dips/Interruptions Test

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: M1: operating

Note:

Table 1:AC mains power input port

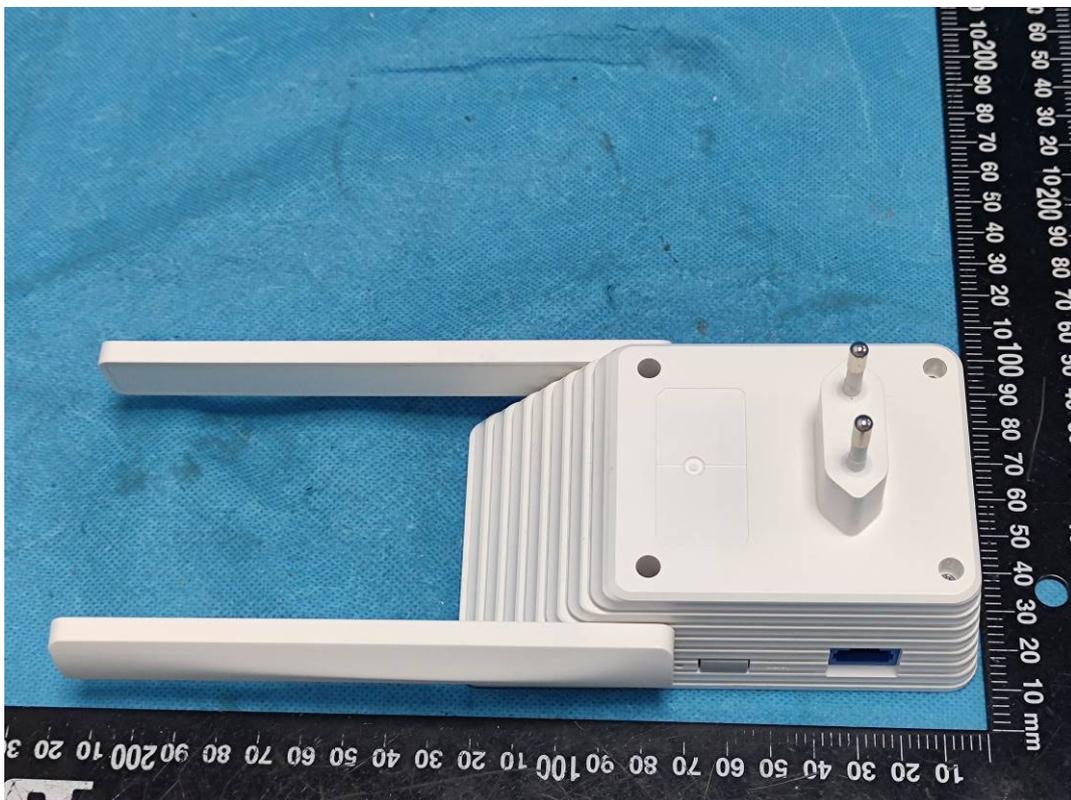
Level	Voltage	Poll	Path	Pass	Fail
1	0.5kV	±	Line-Line	A	/
2	1kV	±	Line-Line	A	/
3	2kV	±	/	/	/
4	4kV	±	/	/	/

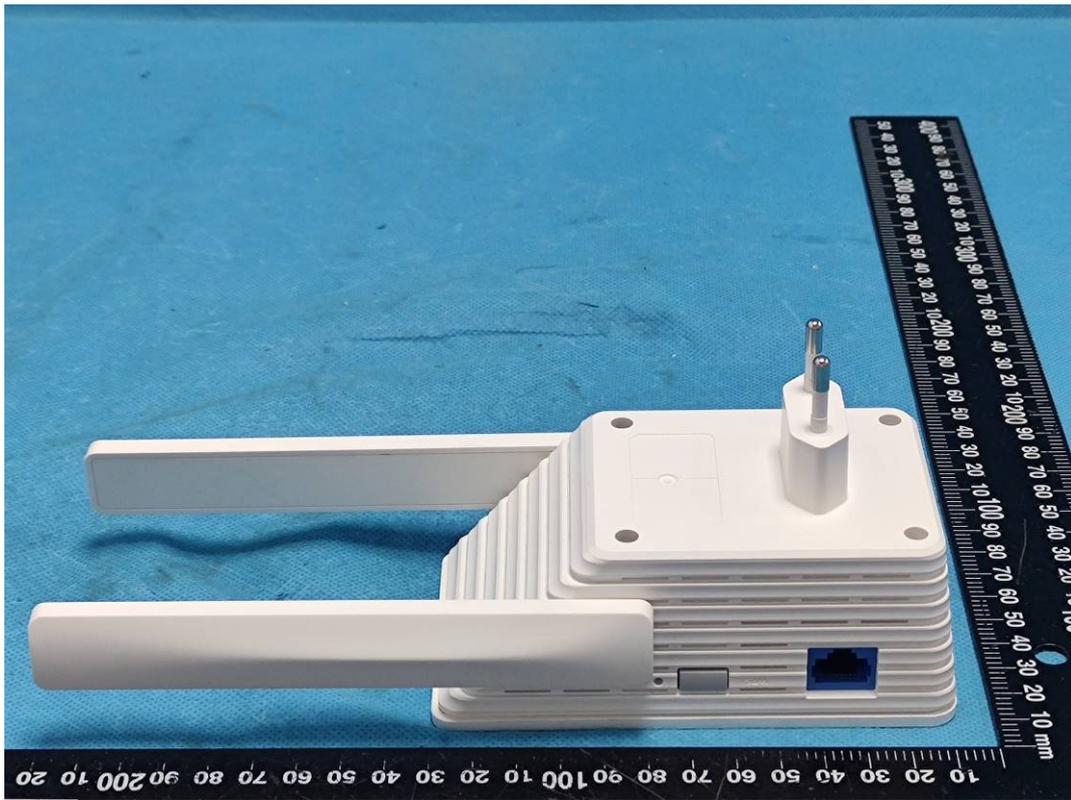
Table 2:RJ45 I/O Circuit and Lines

Level	Voltage	Poll	Path	Pass	Fail
1	0.5kV	±	Line-Ground	A	/
2	1kV	±	Line-Ground	A	/
3	2kV	±	/	/	/

EXHIBITA - EUT PHOTOGRAPHS

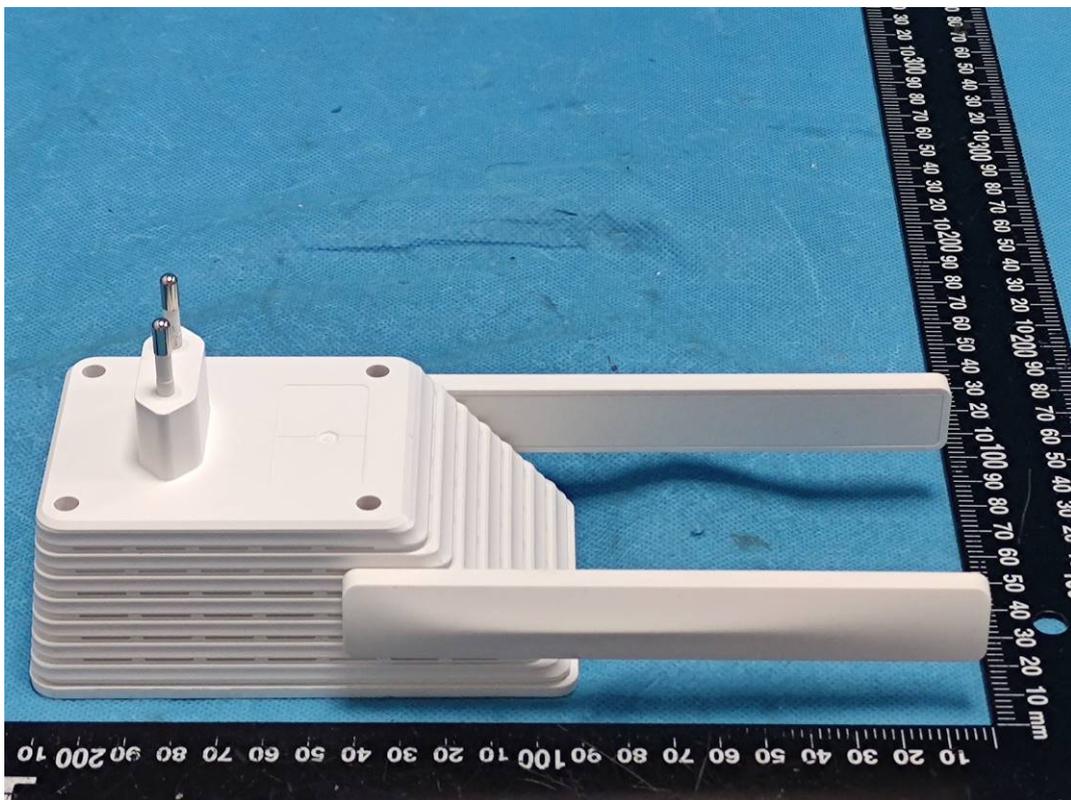
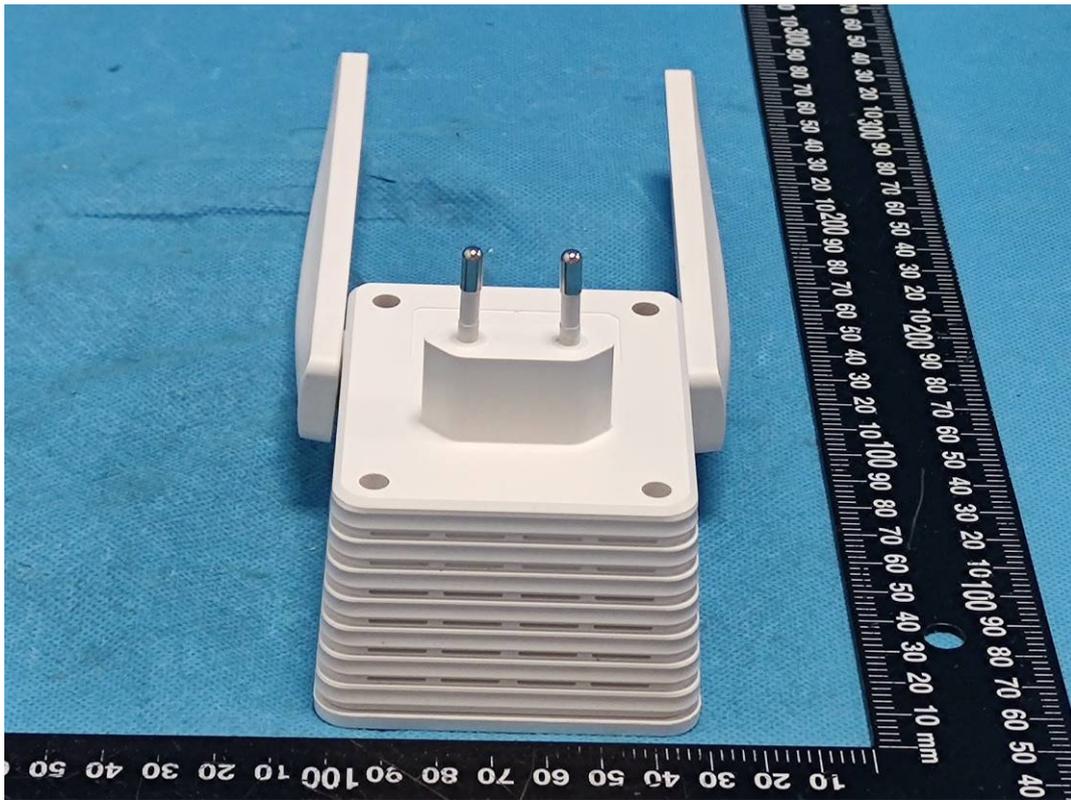
EUT

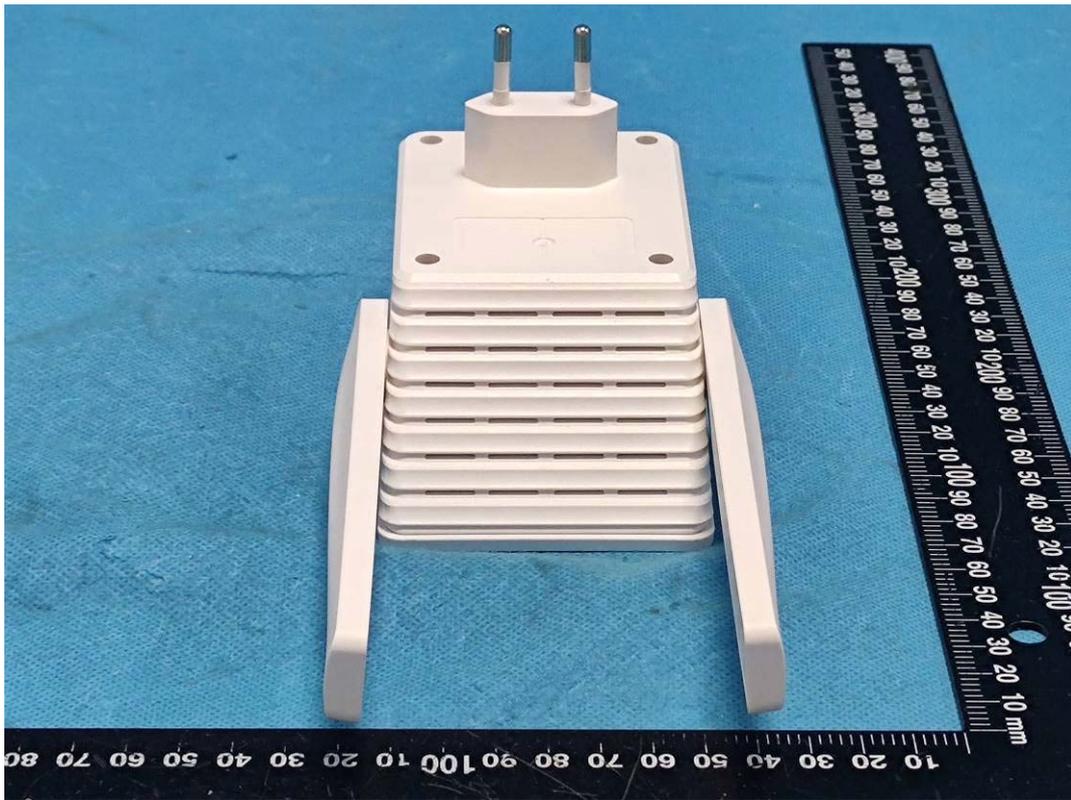




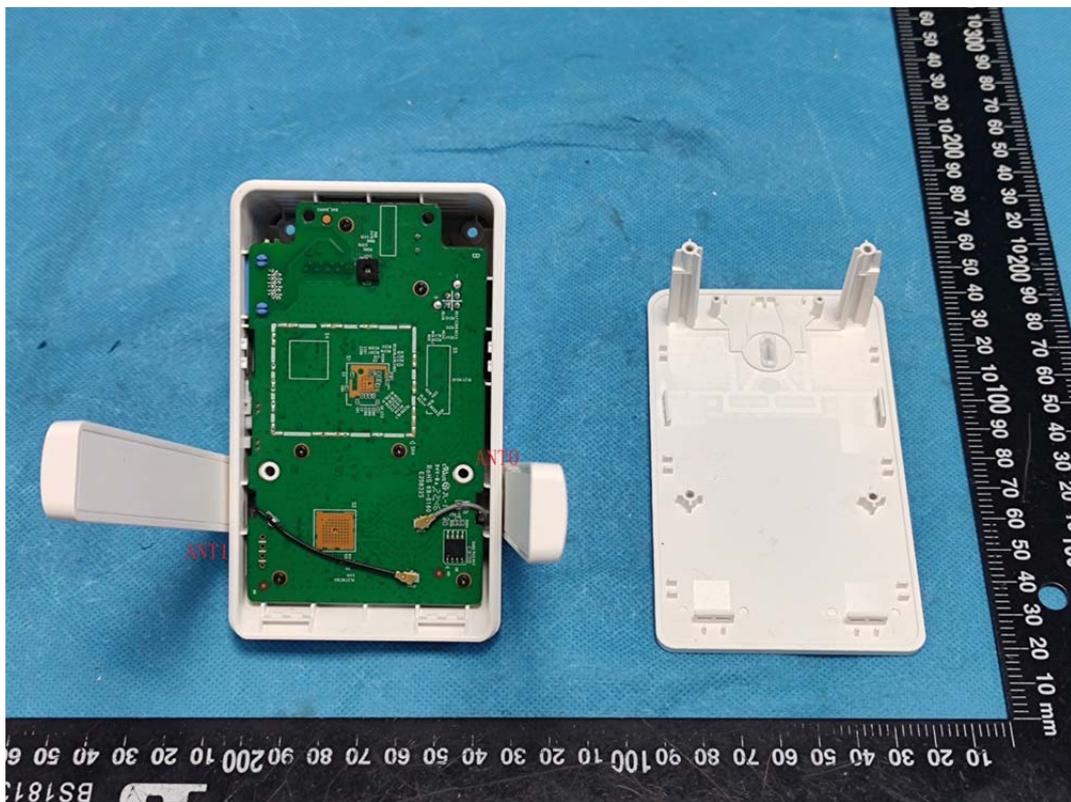
Port

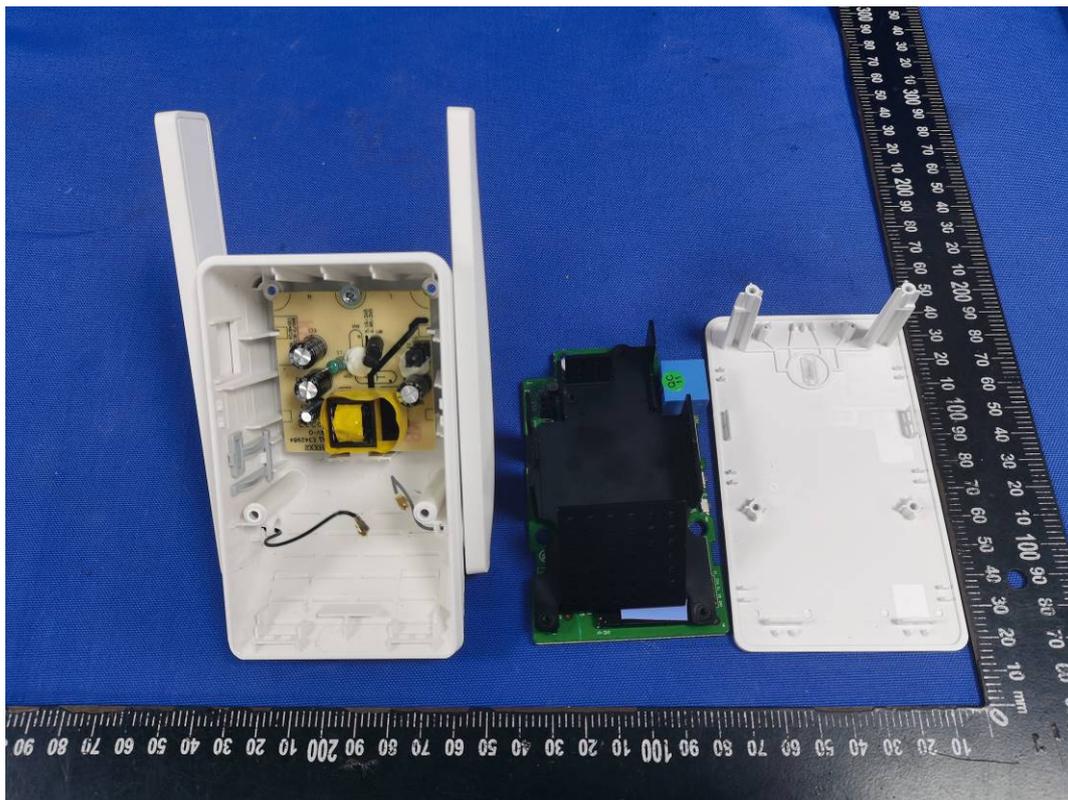




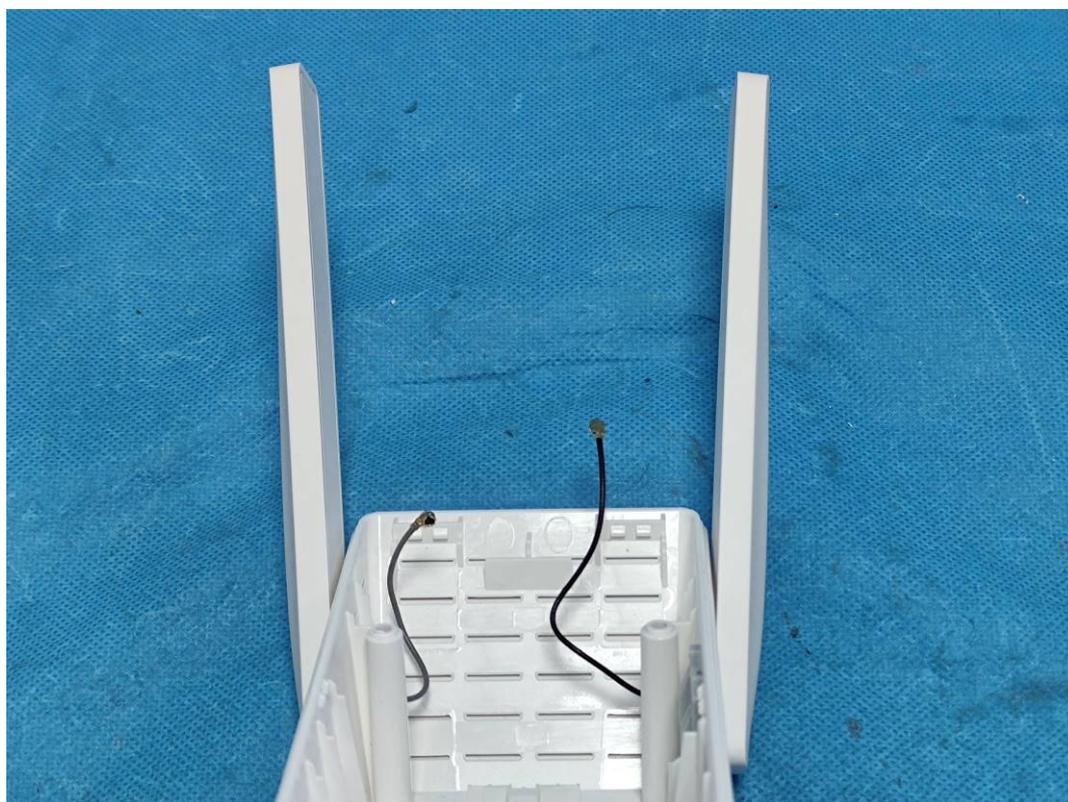


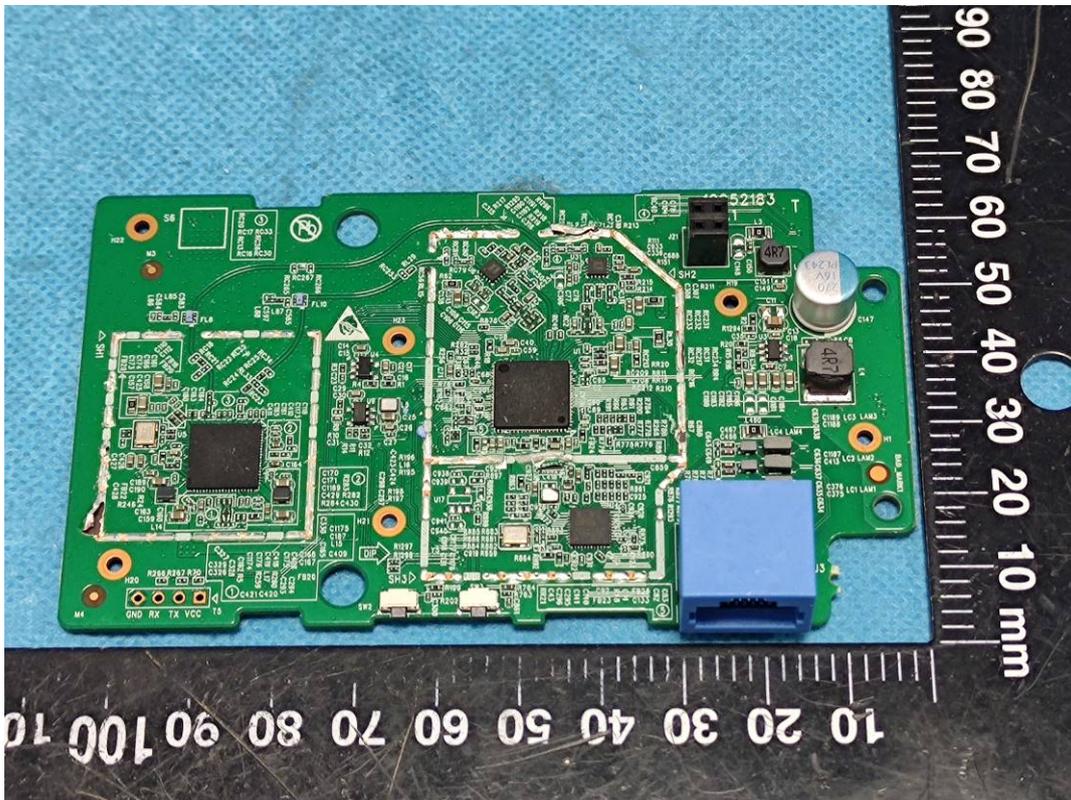
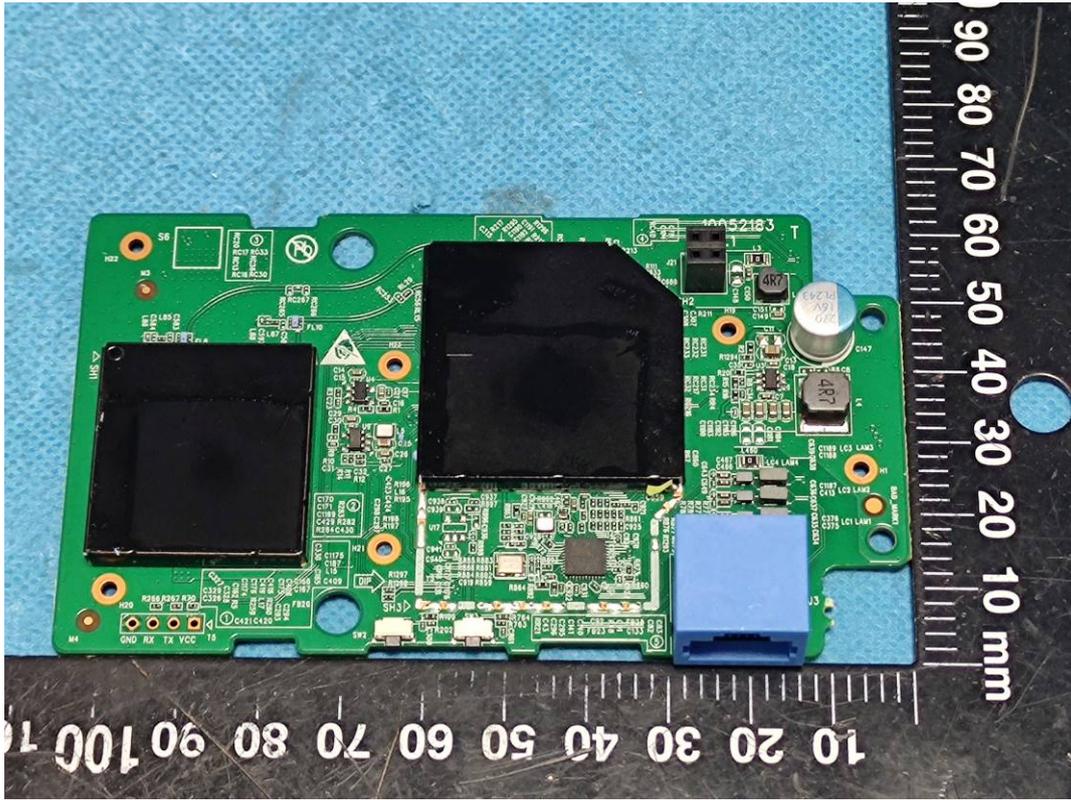
Uncover

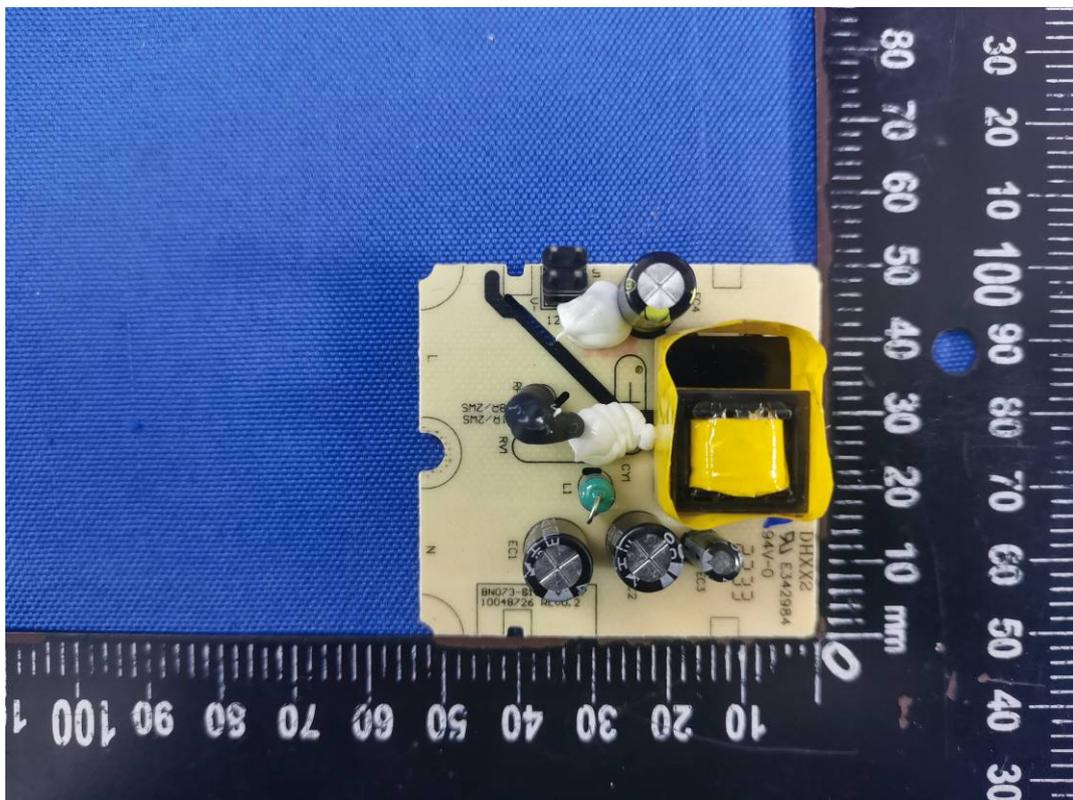
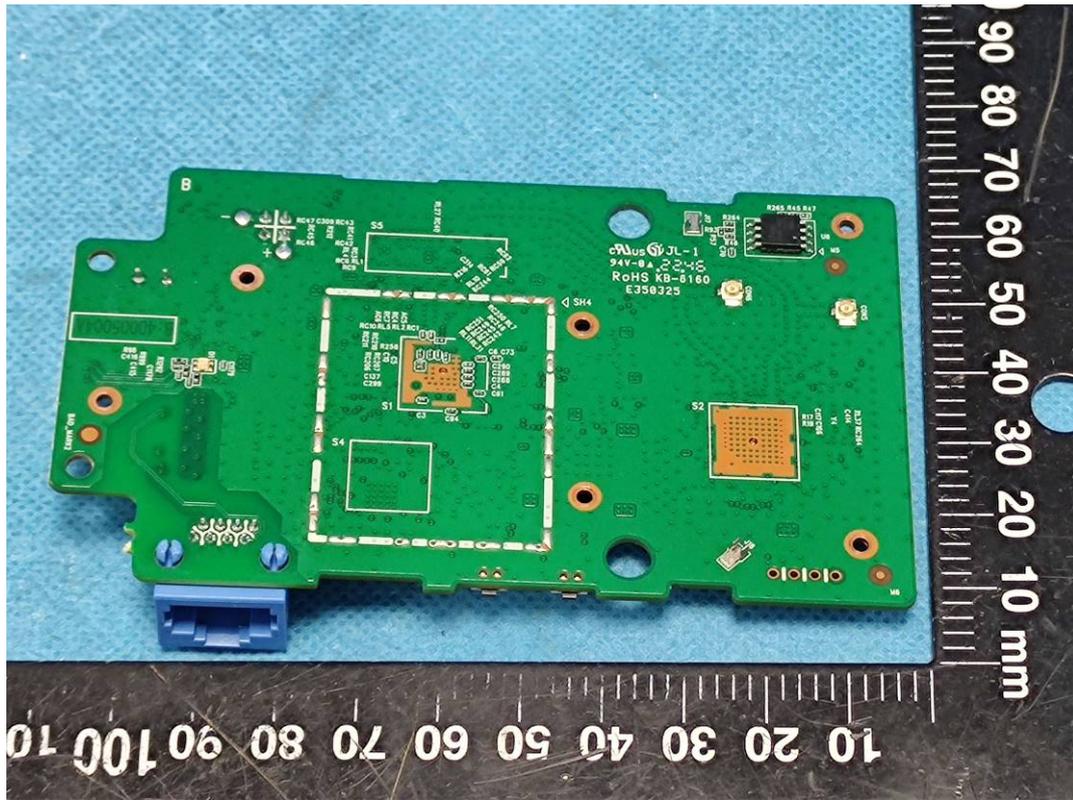




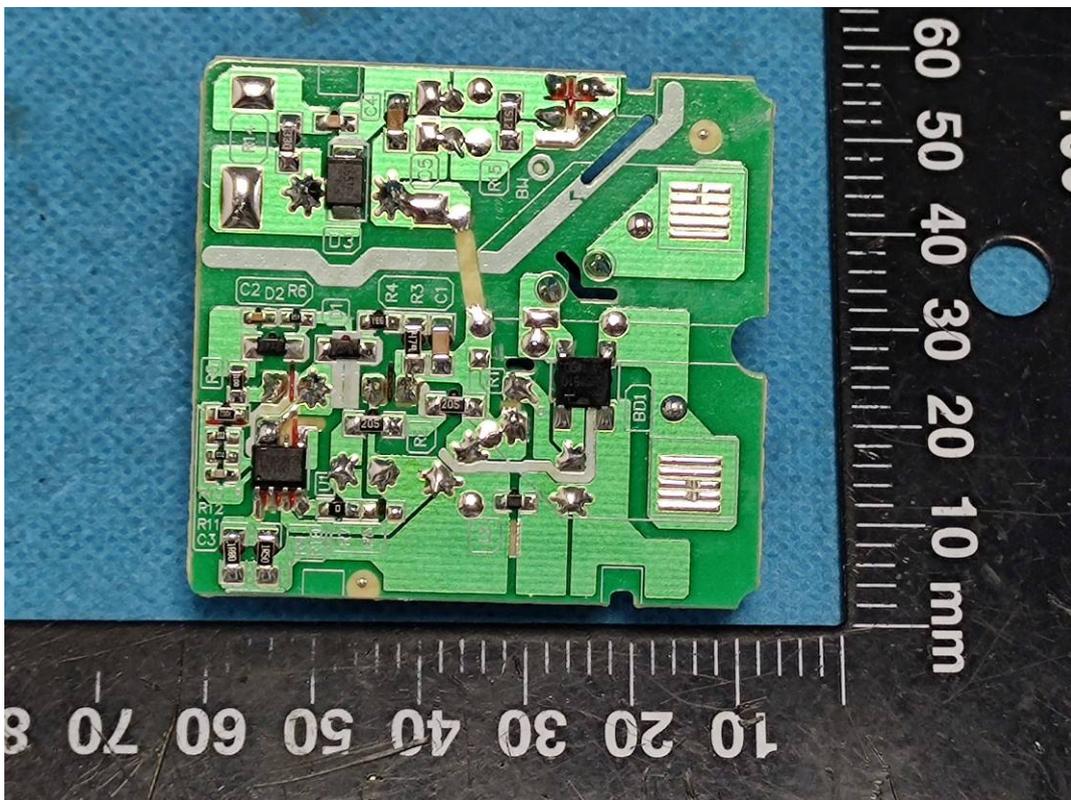
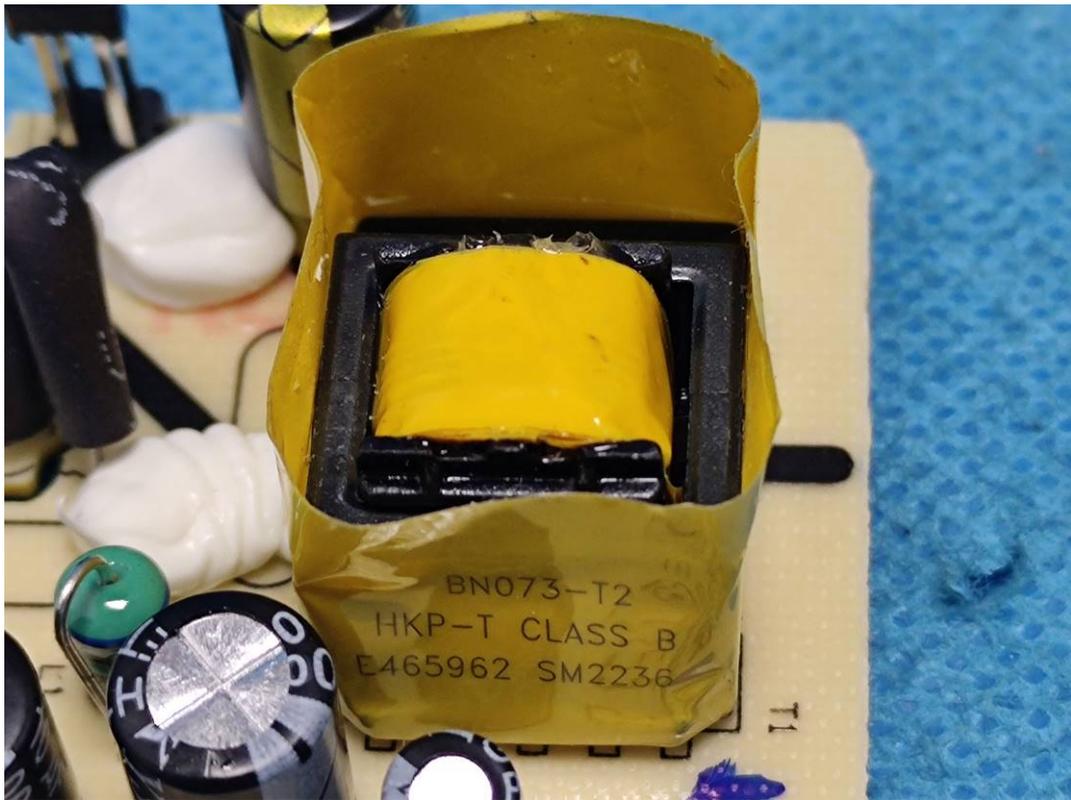
Antenna







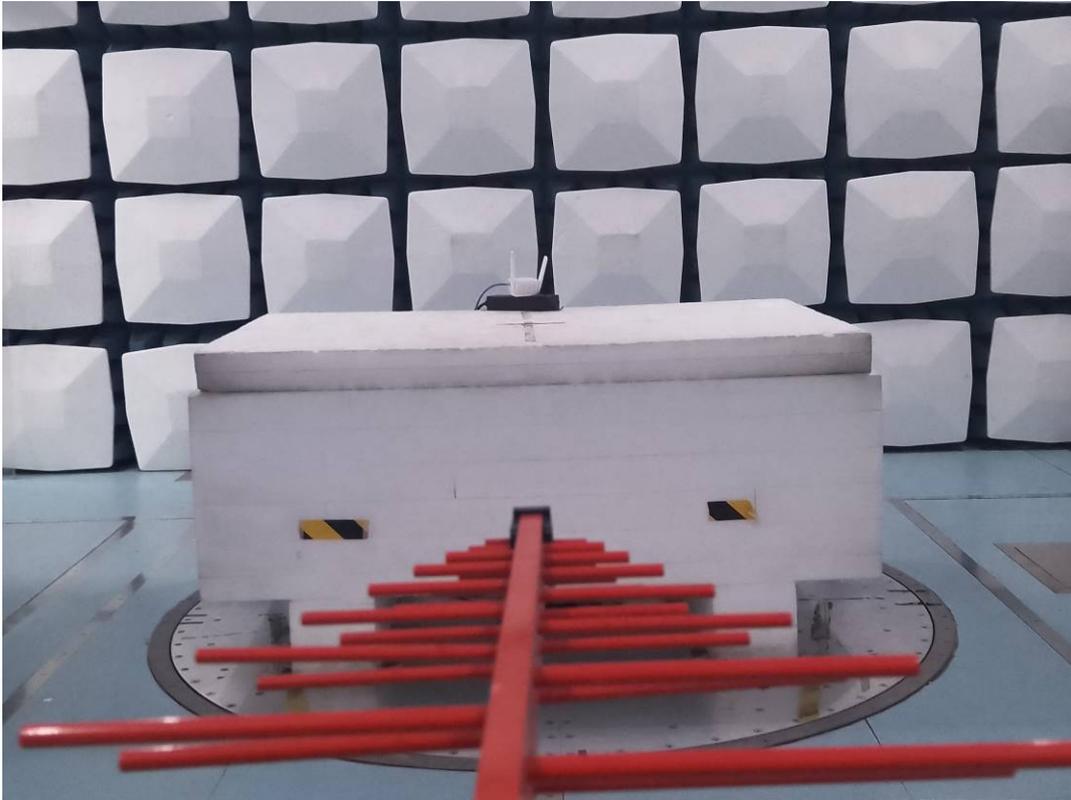
Coil



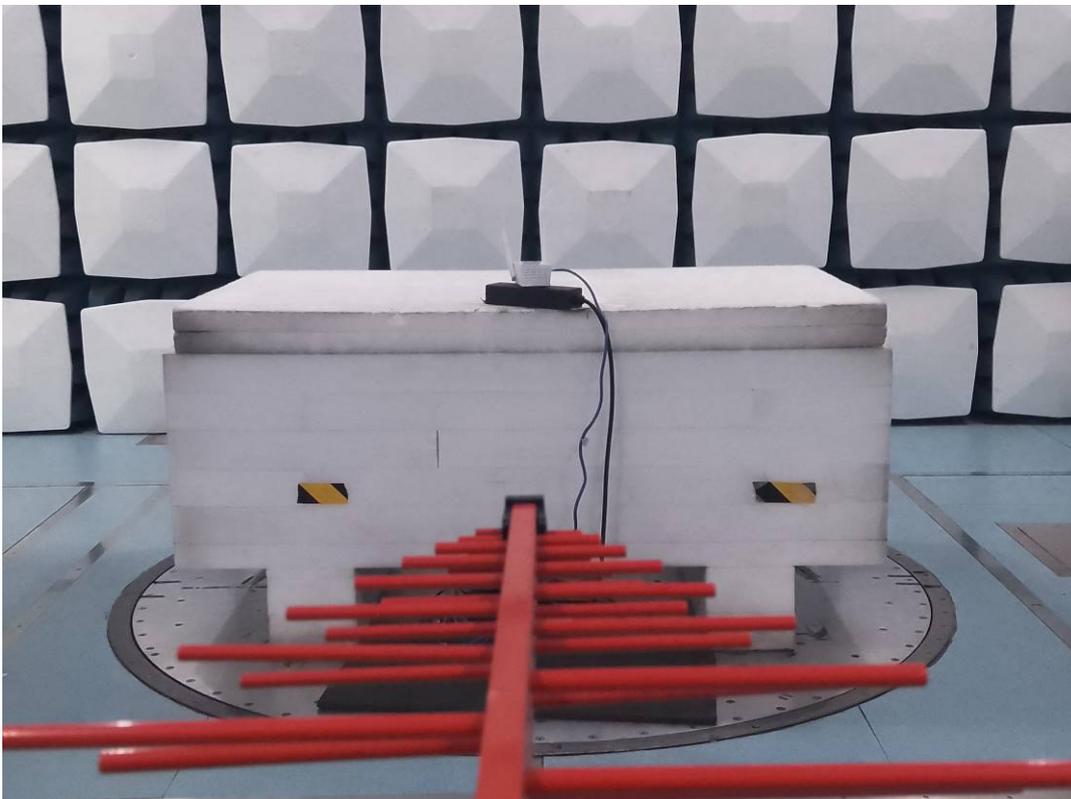
EXHIBITB - TEST SETUP PHOTOGRAPHS

RE

RE Below 1GHz front View



RE Below 1GHz rear View



RE Above 1GHz front View



RE Above 1GHz rear View

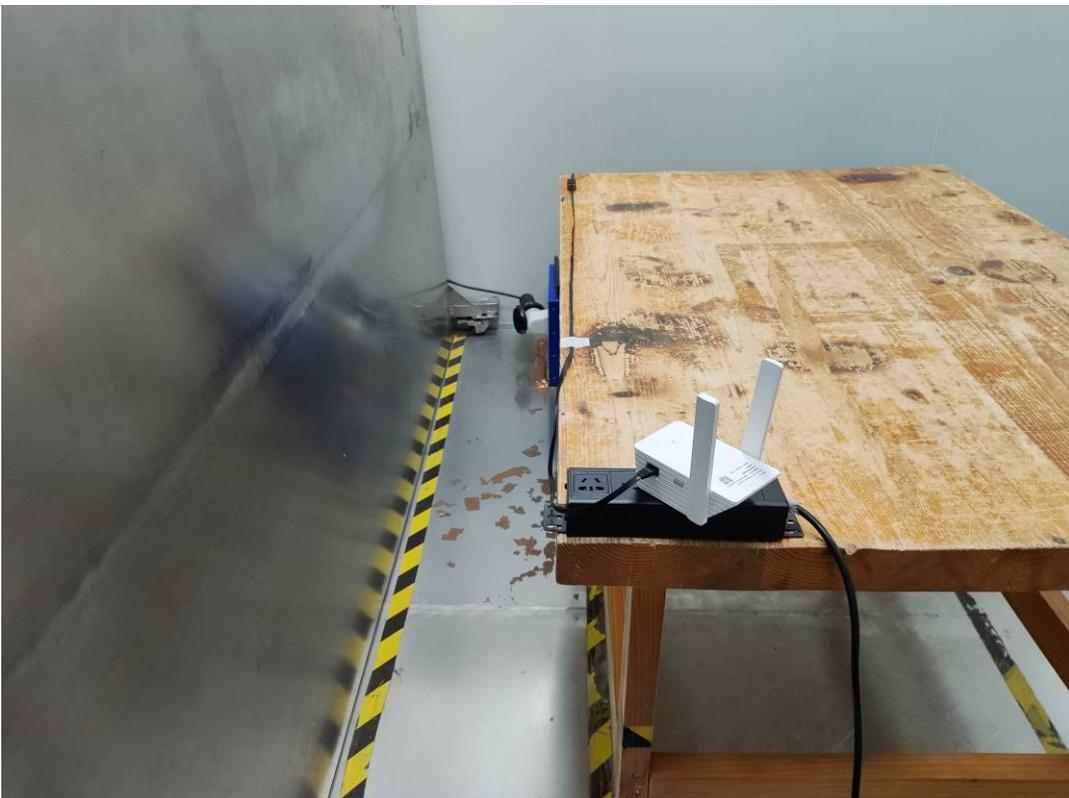


CE_AC

CE front View



CE side View



CE_net

CE front View



CE side View



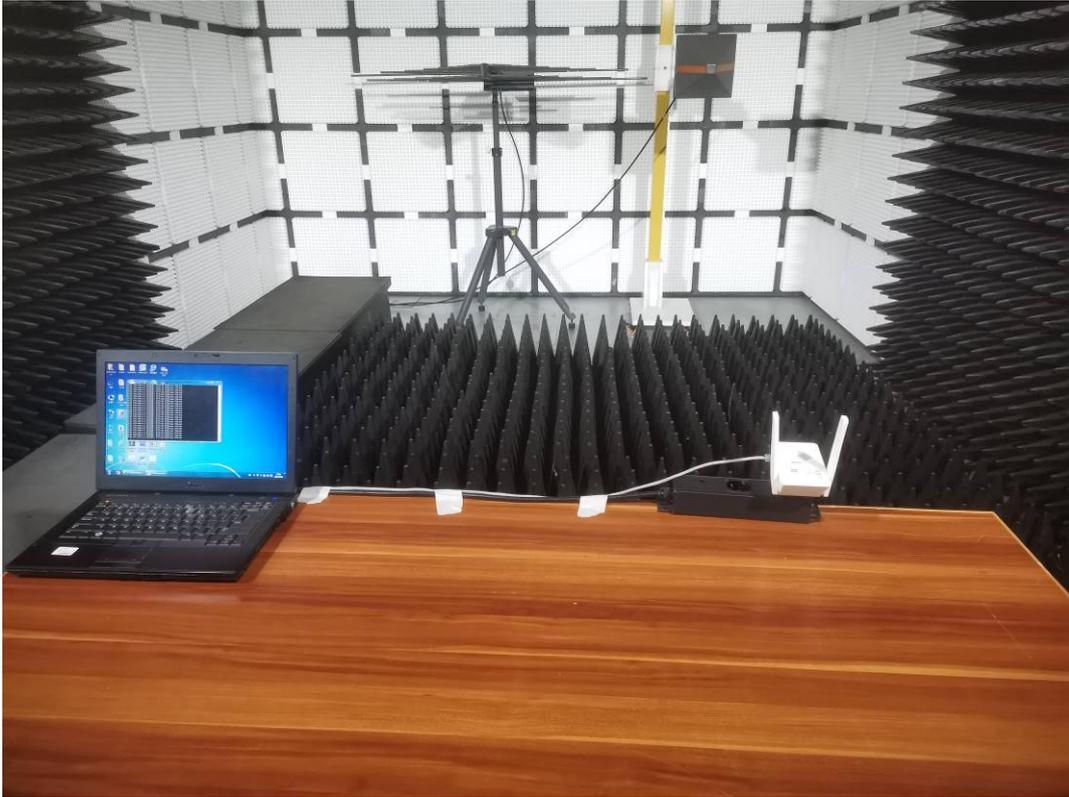
Flicker

Test Setup Photo View



RS

Test Setup Photo View



ESD

Test Setup Photo View

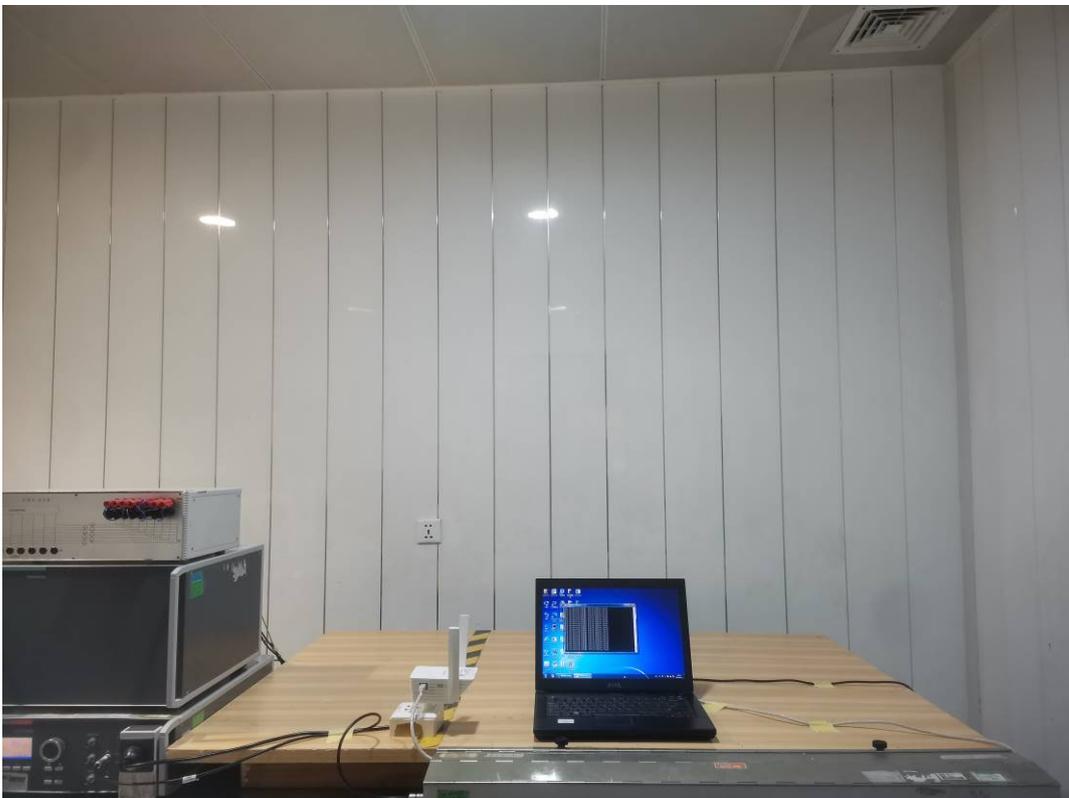


EFT

AC Port Test Setup Photo M1



Signal Port Test Setup Photo M1



Dips

Test Setup Photo View

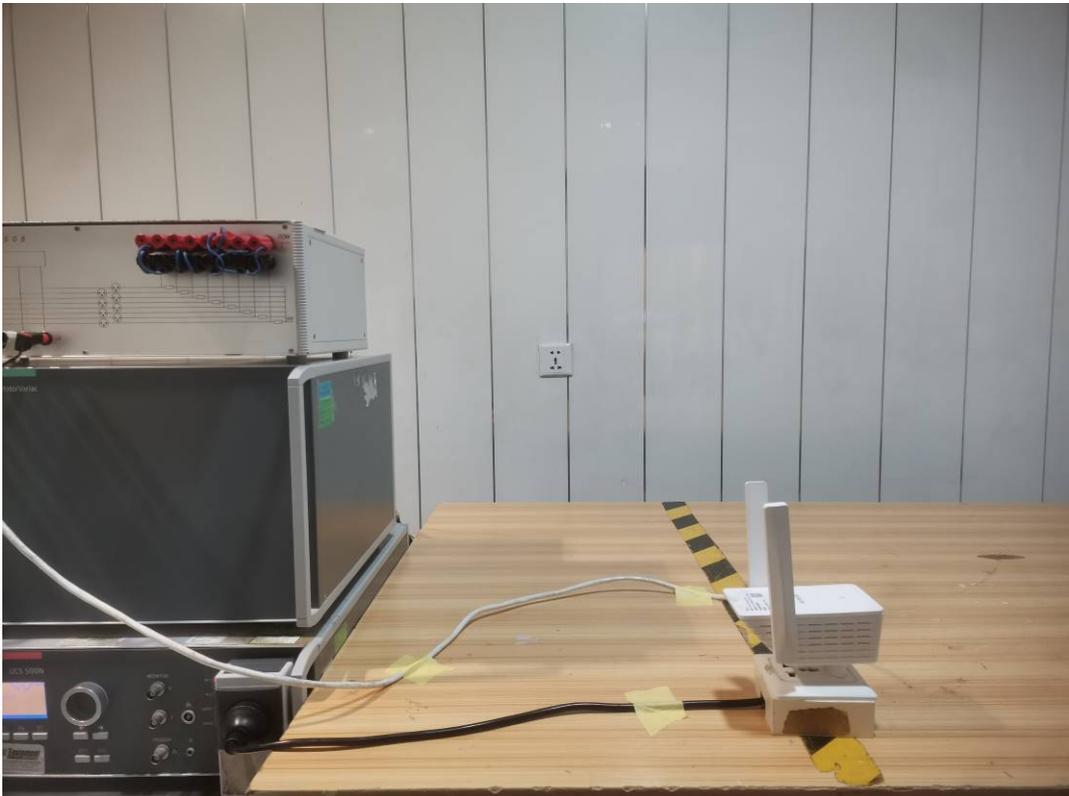


Surge

AC Port Test Setup Photo M1



Signal Port Test Setup Photo M1

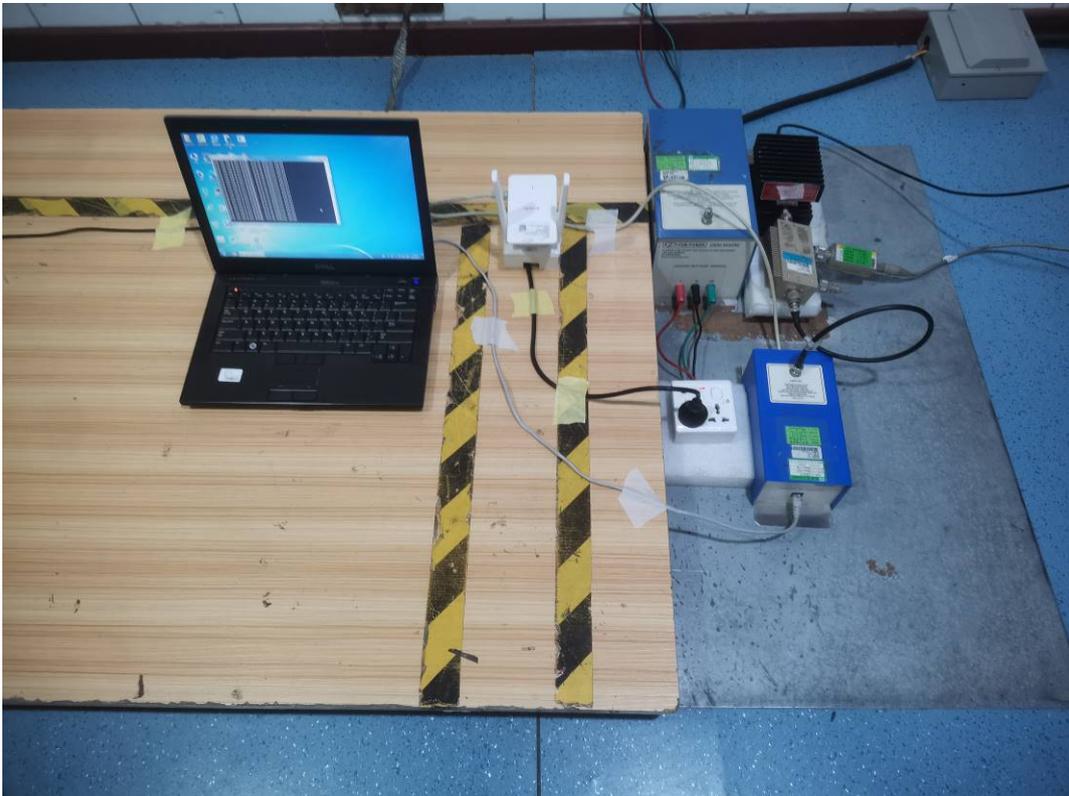


CS

AC Port Test Setup Photo M1



Signal Port Test Setup Photo M1



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