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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: U2

Report Type: Original Report	Product Type: AX300 Wi-Fi 6 High Gain USB Adapter
Report Number:	DG2230825-49932E-02
Report Date:	2023/9/22
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
1.0	DG2230825-49932E-02	Original Report	2023/9/22

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

EUT Name:	AX300 Wi-Fi 6 High Gain USB Adapter
EUT Model:	U2
Rated Input Voltage:	5Vdc from USB
Serial Number:	2AFL-1 ,
EUT Received Date:	2023/8/26
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

The information marked ▲ is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.

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:

M1: Operating

Equipment Modifications

No modification was made to the EUT.

EUT Exercise Software

No software was used.

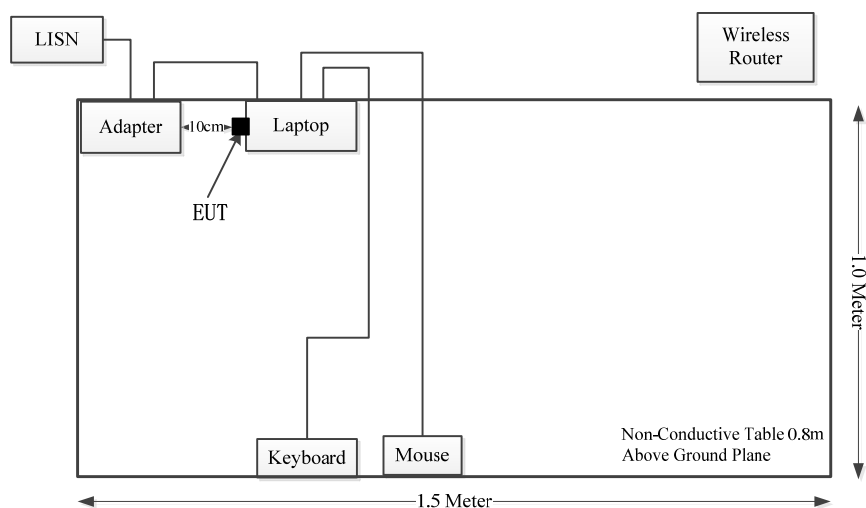
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
Dell	Keyboard	KB212-B	CN-0K6KPN-71616-24N-0658-A00
PHILIPS	Mouse	SPK7214	M214BQ210411115
Lenovo	Adapter	92P1109	11S92P1109Z1ZBTZ93A6YG
Lenovo	Laptop	E480	PF-1QQYYP 19/06
ZIONCOM	Wireless Router	MB-R210-00	EMZBWR21103004

Support Cable List and Details

Cable Description	Shielding Cable	Ferrite Core	Length (m)	From Port	To
Power Cable	NO	NO	1.0	LISN	Adapter

Block Diagram of Test Setup



Test Equipment List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted emission					
R&S	LISN	ENV216	101614	2022/11/18	2023/11/17
R&S	EMI Test Receiver	ESCI	100035	2022/11/18	2023/11/17
MICRO-COAX	Coaxial Cable	C-NJNJ-50	C-0200-01	2022/9/5	2023/9/4
R&S	Test Software	EMC32	V9.10.00	N/A	N/A
Radiated emissions below 1GHz					
Sunol Sciences	Hybrid Antenna	JB3	A060611-2	2023/8/25	2026/8/24
Narda	Attenuator	757C-6dB	34010	2023/8/1	2024/7/31
Unknown	Coaxial Cable	C-NJNJ-50	C-1000-01	2023/8/1	2024/7/31
Unknown	Coaxial Cable	C-NJNJ-50	C-0400-04	2023/8/1	2024/7/31
Unknown	Coaxial Cable	C-NJNJ-50	C-0530-01	2023/8/1	2024/7/31
Sonoma	Amplifier	310N	185914	2023/8/1	2024/7/31
R&S	EMI Test Receiver	ESCI	100224	2022/11/18	2023/11/17
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Radiated emissions above 1GHz					
AH	Horn Antenna	SAS-571	1394	2023/2/22	2026/2/21
HUBER+SUHNER	Coaxial Cable	SUCOFLEX 126EA	MY369/26/26E A	2022/10/13	2023/10/12
Unknown	Coaxial Cable	C-NJNJ-50	C-0200-02	2022/9/4	2023/9/3
AH	Preamplifier	PAM-0118P	530	2022/10/13	2023/10/12
R&S	Spectrum Analyzer	FSP 38	100478	2022/11/22	2023/11/21
E-Microwave	Band Rejection Filter	OBSF-2400-2483.5-S	OE01601525	2023/6/16	2024/6/15
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A
Flicker					
EVERFINE	Harmonic & Flicker Measurement System	HFM3000	P630850CD1411115	2022/11/16	2023/11/15
EVERFINE	Harmonic & Flicker Testing Power Source	HFS-4000	P624486CD1411122	2022/11/22	2023/11/21
CS					
HP	Signal Generator	8648A	3426A00831	2022/11/22	2023/11/21
AR	Power Amplifier	15A250	12934	N/A	N/A
Werlatone	Dual Directional Coupler	C5091-10	113192	2023/2/9	2024/2/8
NARDA	Attenuator	769-6	02754	N/A	N/A
HP	Power Meter	EPM-441A	GB37481494	2022/11/18	2023/11/17
Agilent	Power sensor	8482A	US37296108	2022/11/18	2023/11/17
COM-POWER	CDN	M325E	521064	2022/11/22	2023/11/21
EFT & Surge & Dips					
EM TEST	EMS Comprehensive Tester	Compact NX5	P1850225473	2022/11/16	2023/11/15
EM TEST	AC Autotransformer	MV2616	P1401128614	N/A	N/A
ESD					
TESEQ	ESD Generator	NSG 438	1019	2022/11/16	2023/11/15

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
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	2023/7/15	2024/7/14
Agilent	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:	24.8°C	28.7°C	26.4°C	22.3~27.2°C	26.9°C
Relative Humidity:	59%	57%	45%	54~60%	60%
ATM Pressure:	99.7kPa	99.7kPa	100.1kPa	99.6kPa	99.6kPa
Tester:	Joe Li	Charlwin Zhang	Colin Yang	Lane Sun	Lane Sun
Test Date:	2023/8/29	2023/8/28	2023/8/31	2023/9/4	2023/9/4

Note: The relative humidity of ESD test site is 54%.

SUMMARY OF TEST RESULTS

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

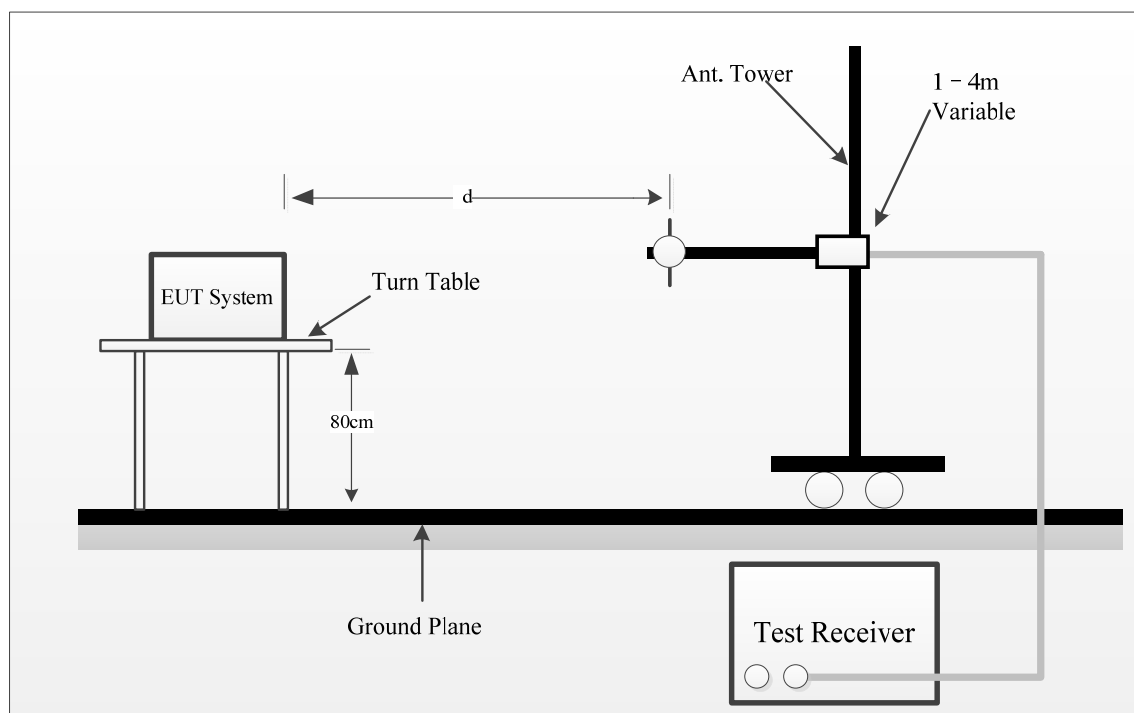
Based on CISPR 16-4-2: 2011^{*}, measurement uncertainty of radiated emission at a distance of 10m at Bay Area Compliance Laboratories Corp. (Dongguan) is: 30M~200MHz: 4.55 dB for Horizontal, 4.57 dB for Vertical; 200M~1GHz: 4.66 dB for Horizontal, 4.56 dB for Vertical; measurement uncertainty of radiated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

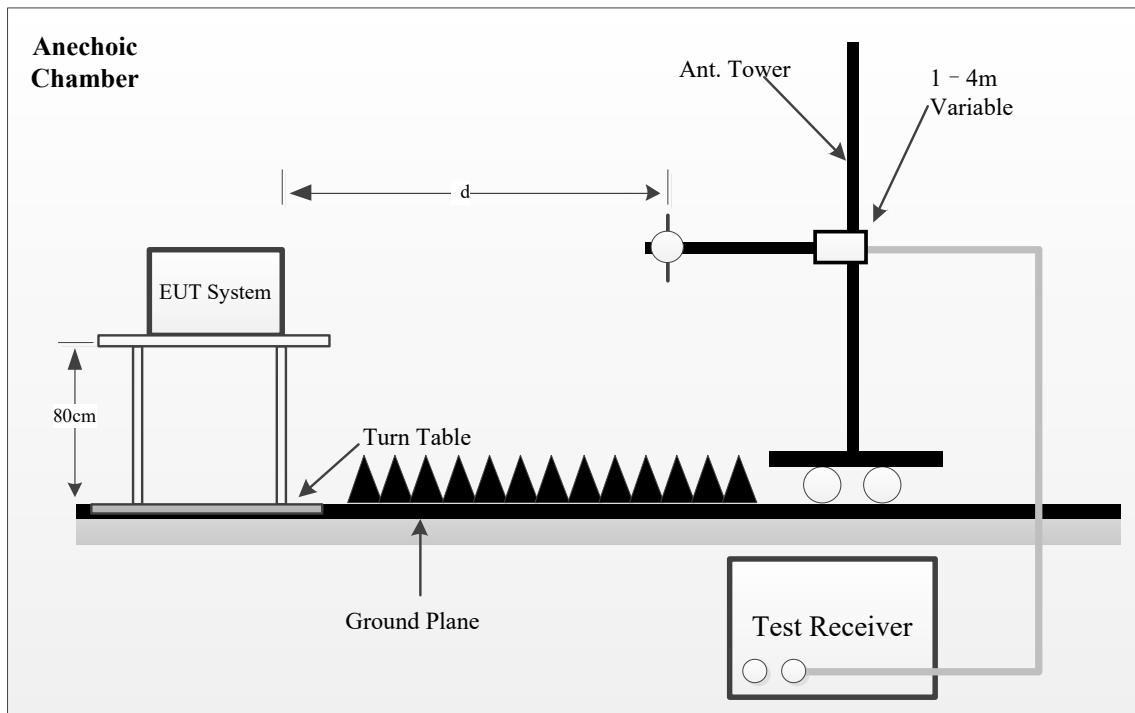
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC)(30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR)(1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR)(6 GHz to 18 GHz)	5.5 dB

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: $\text{Result} = \text{Meter Reading} + \text{Corrected}$

Note:

$\text{Corrected} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$, or

$\text{Corrected} = \text{Antenna Factor} + \text{Cable Loss} + \text{Insertion loss of attenuator} - \text{Amplifier Gain}$

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: $\text{Margin} = \text{Limit} - \text{Result}$

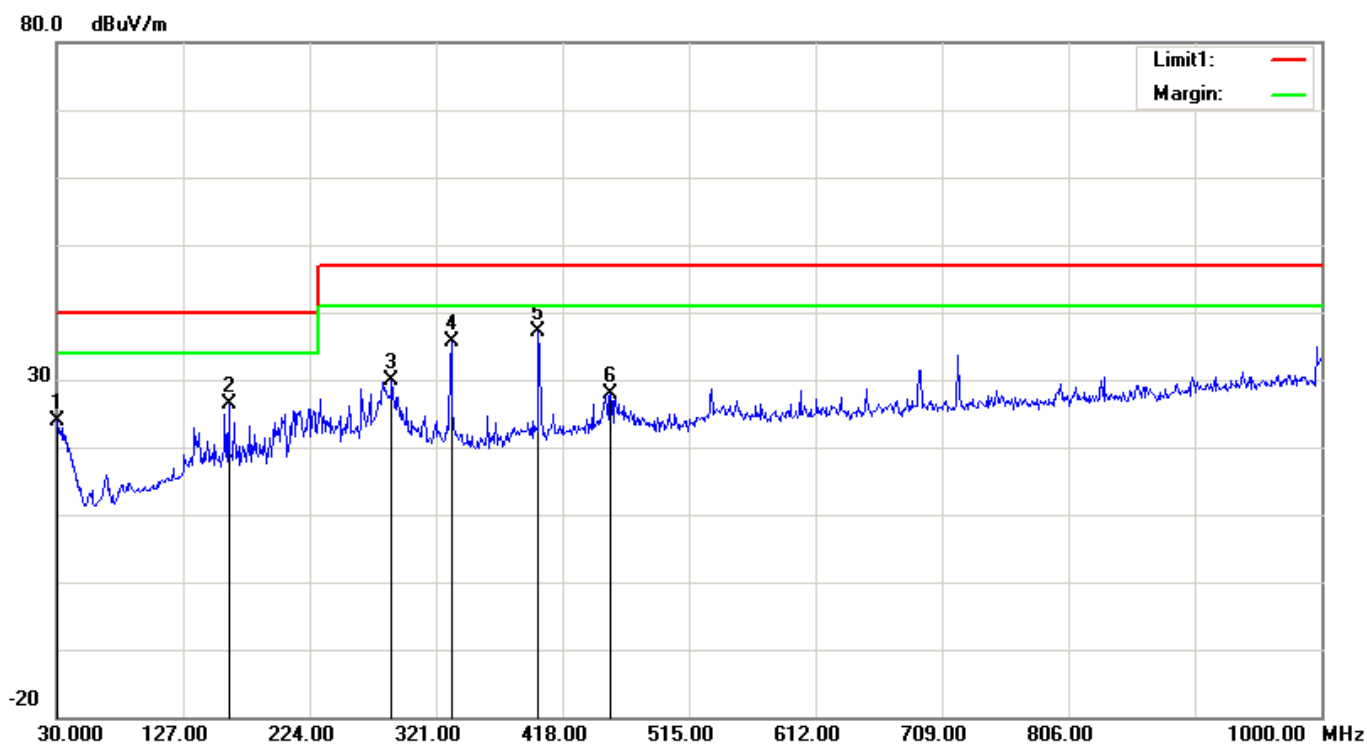
Test Data

Please refer to following table and plots:

Below 1G

Condition: EN 301 489 Class B 3m Radiation
Test Mode: M1
Note: 2AFL-1(110V)

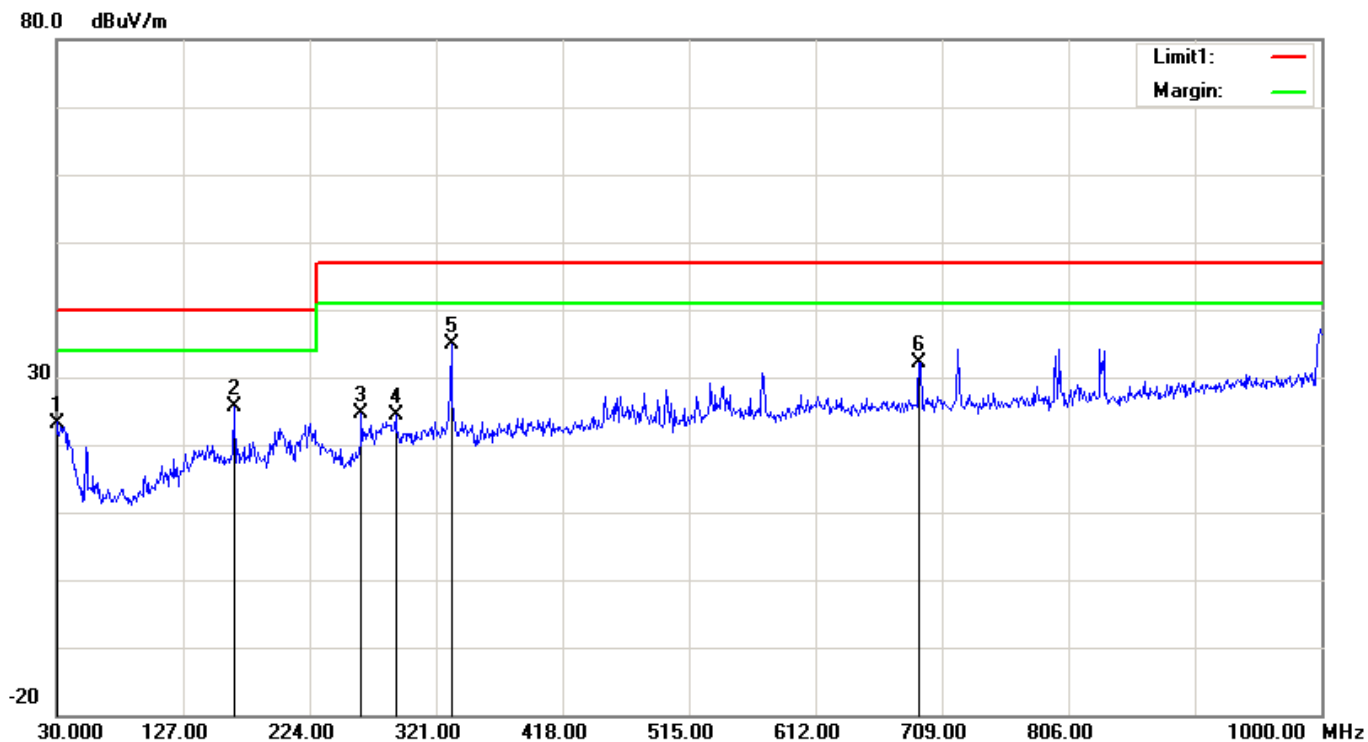
Polarization: Horizontal
Distance: 3m
Power Source: AC 110V/60Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dB μ V)		(dB/m)	(dB μ V/m)	(dB μ V/m)	(dB)
1	30.0000	27.84	peak	-3.88	23.96	40.00	16.04
2	161.9200	35.74	peak	-9.40	26.34	40.00	13.66
3	287.0500	38.46	peak	-8.53	29.93	47.00	17.07
4	332.6400	42.53	peak	-7.02	35.51	47.00	11.49
5	399.5700	42.25	peak	-5.17	37.08	47.00	9.92
6	454.8600	32.59	peak	-4.73	27.86	47.00	19.14

Condition: EN 301 489 Class B 3m Radiation
Test Mode: M1
Note: 2AFL-1(110V)

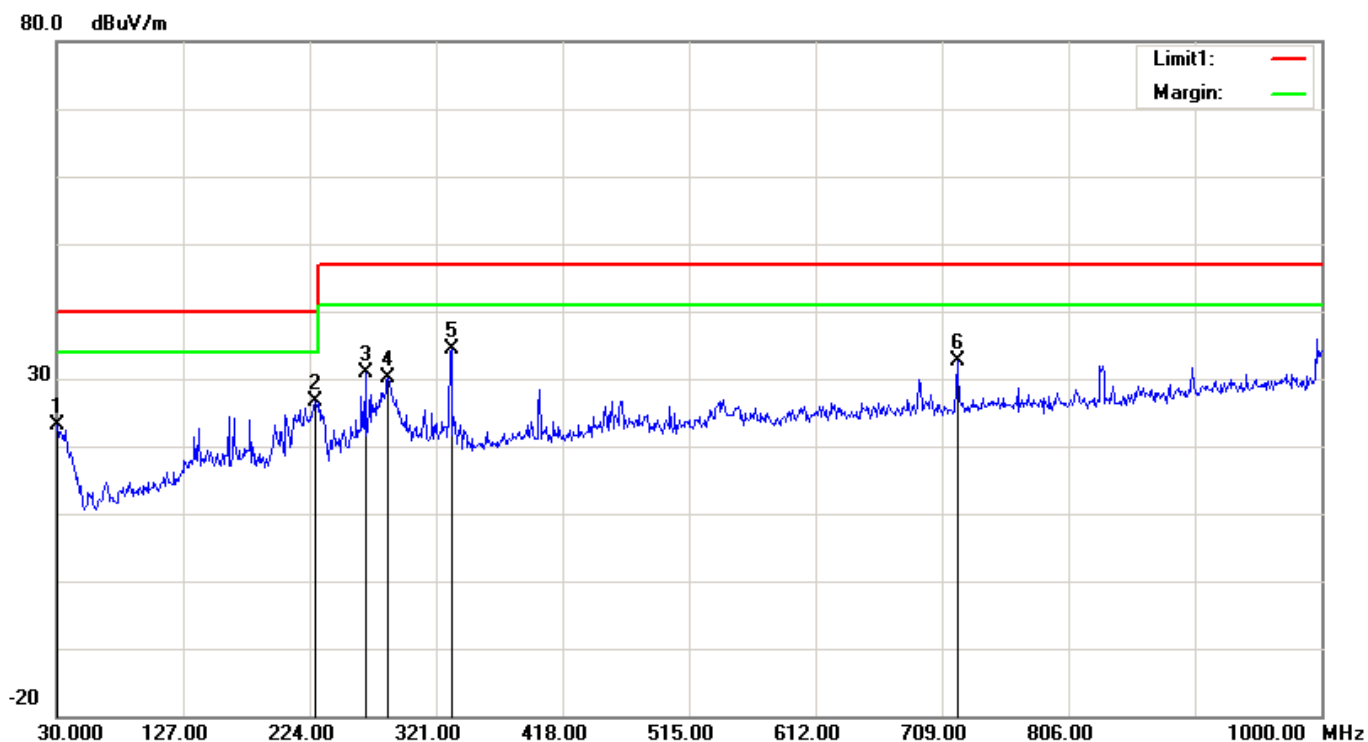
Polarization: Vertical
Distance: 3m
Power Source: AC 110V/60Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	30.0000	27.13	peak	-3.88	23.25	40.00	16.75
2	165.8000	34.94	peak	-9.36	25.58	40.00	14.42
3	263.7700	33.86	peak	-9.13	24.73	47.00	22.27
4	289.9600	32.65	peak	-8.33	24.32	47.00	22.68
5	332.6400	41.96	peak	-7.02	34.94	47.00	12.06
6	691.5400	32.35	peak	-0.12	32.23	47.00	14.77

Condition: EN 301 489 Class B
Test Mode: M1
Note: 2AFL-1(230V)

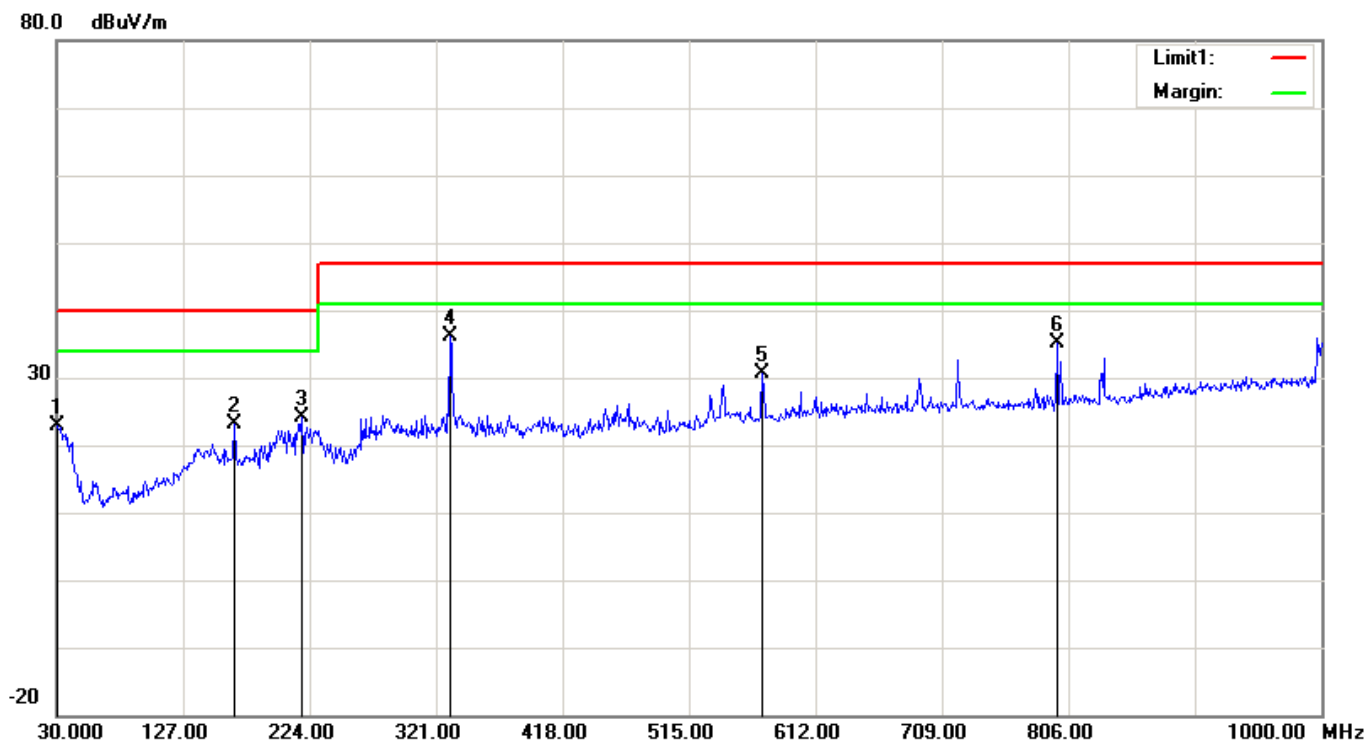
Polarization: Horizontal
Distance: 3m
Power Source: AC 230V/50Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	30.9700	27.50	peak	-4.46	23.04	40.00	16.96
2	228.8500	37.40	peak	-10.89	26.51	40.00	13.49
3	266.6800	39.76	peak	-8.90	30.86	47.00	16.14
4	284.1400	38.79	peak	-8.70	30.09	47.00	16.91
5	332.6400	41.28	peak	-7.02	34.26	47.00	12.74
6	720.6400	32.87	peak	-0.12	32.75	47.00	14.25

Condition: EN 301 489 Class B
Test Mode: M1
Note: 2AFL-1(230V)

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

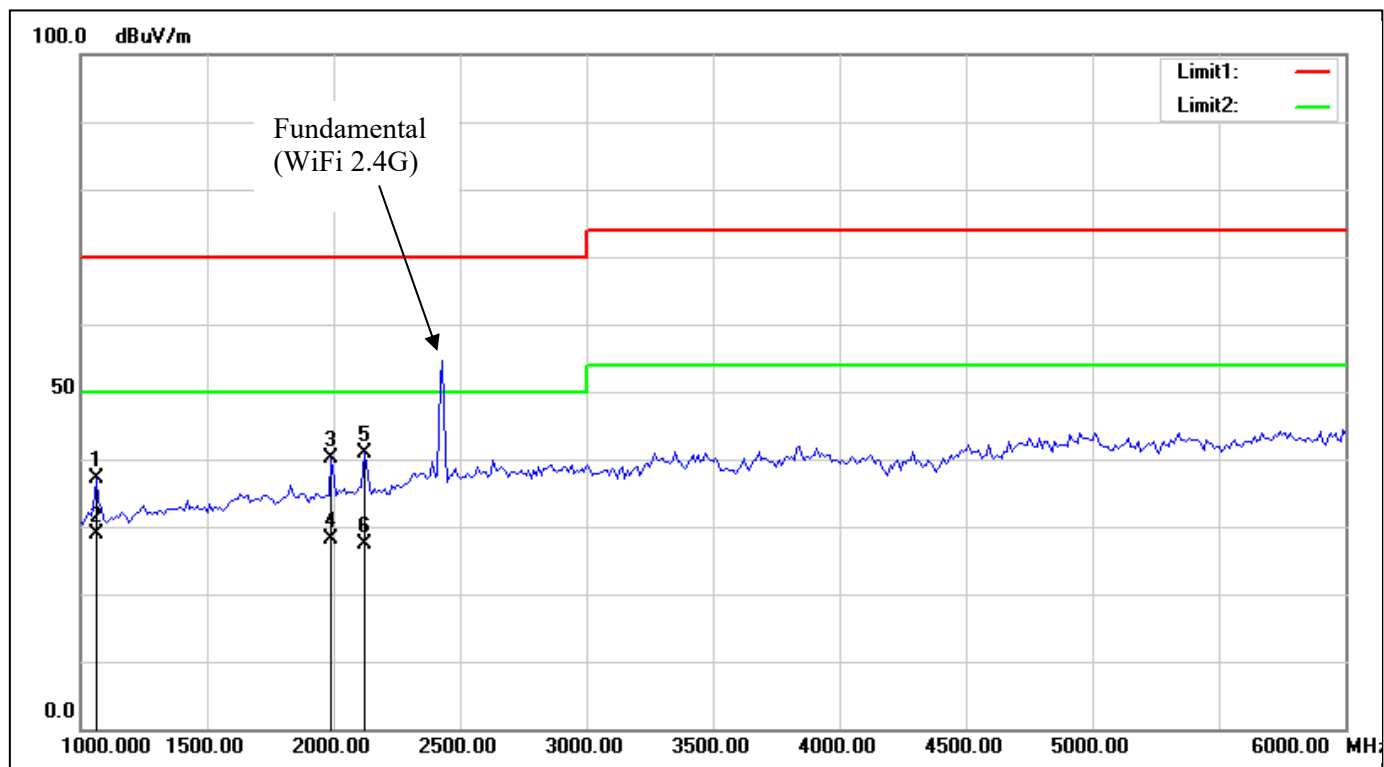


No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dB μ V)		(dB/m)	(dB μ V/m)	(dB μ V/m)	(dB)
1	30.9700	27.45	peak	-4.46	22.99	40.00	17.01
2	165.8000	32.41	peak	-9.36	23.05	40.00	16.95
3	218.1800	35.33	peak	-11.21	24.12	40.00	15.88
4	331.6700	43.25	peak	-7.10	36.15	47.00	10.85
5	571.2600	32.53	peak	-1.88	30.65	47.00	16.35
6	797.2700	34.52	peak	0.58	35.10	47.00	11.90

Above 1G

Condition: EN 301 489 Class B
Test Mode: M1
Note: 2AFL-1(110V)

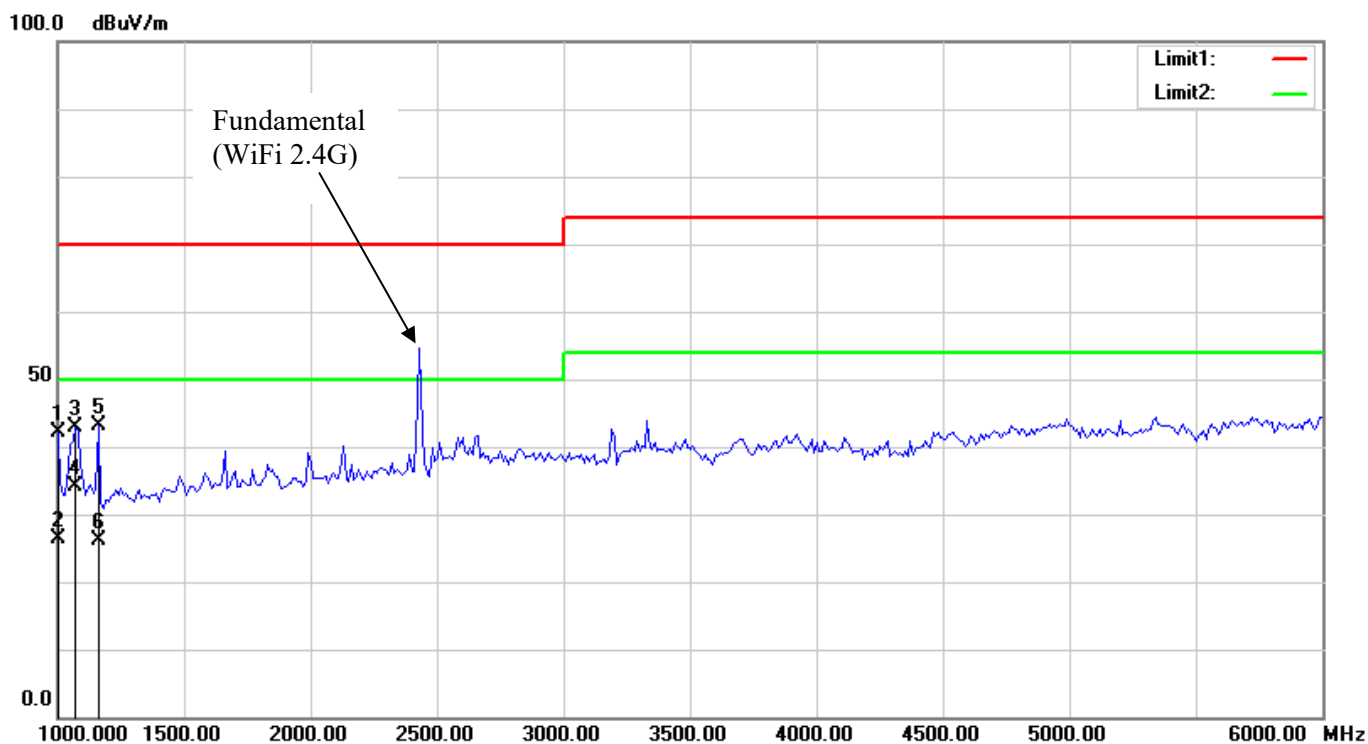
Polarization: Horizontal
Distance: 3m
Power Source: AC 110V/60Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	1060.000	56.42	peak	-19.19	37.23	70.00	32.77
2	1060.000	48.15	AVG	-19.19	28.96	50.00	21.04
3	1990.000	56.09	peak	-15.87	40.22	70.00	29.78
4	1990.000	44.12	AVG	-15.87	28.25	50.00	21.75
5	2120.000	56.08	peak	-15.11	40.97	70.00	29.03
6	2120.000	42.44	AVG	-15.11	27.33	50.00	22.67

Condition: EN 301 489 Class B
Test Mode: M1
Note: 2AFL-1(110V)

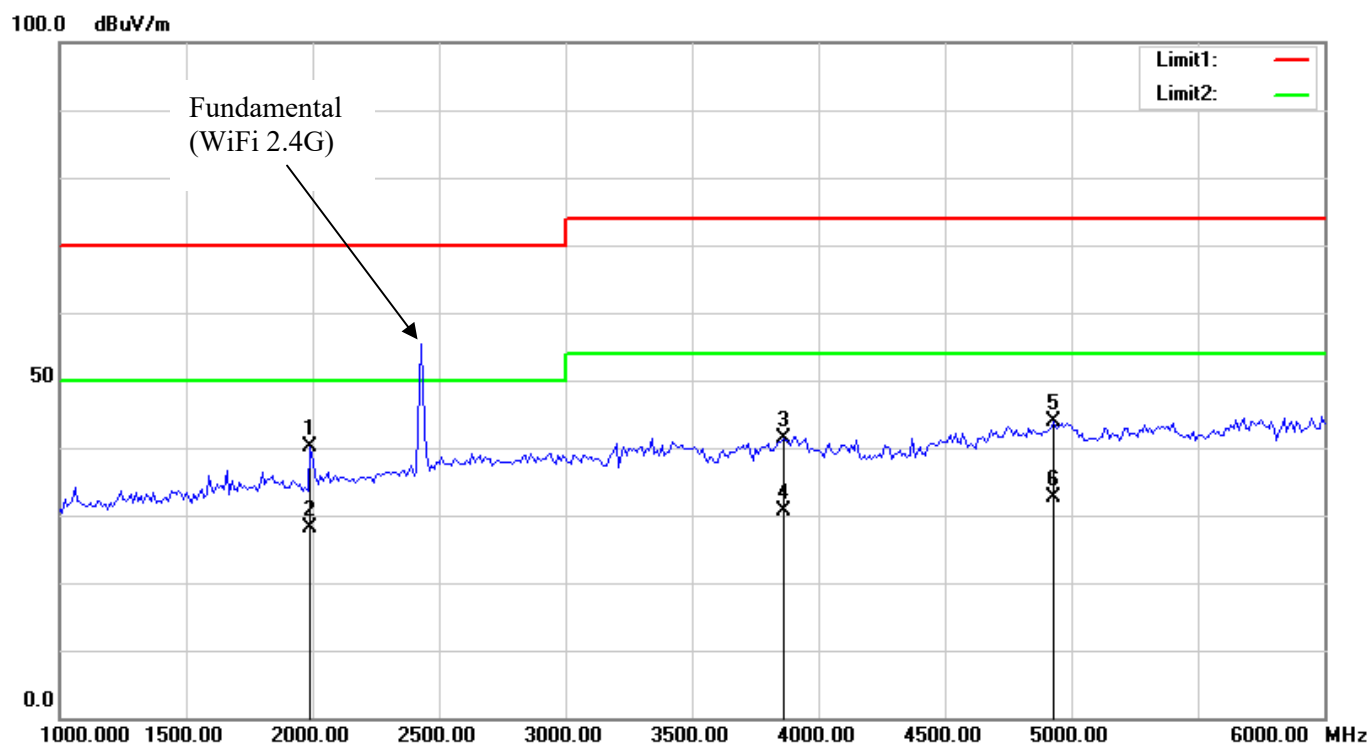
Polarization: Vertical
Distance: 3m
Power Source: AC 110V/60Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	1000.0000	61.64	peak	-19.42	42.22	70.00	27.78
2	1000.0000	45.79	AVG	-19.42	26.37	50.00	23.63
3	1070.000	61.99	peak	-19.18	42.81	70.00	27.19
4	1070.000	53.28	AVG	-19.18	34.10	50.00	15.90
5	1160.000	61.82	peak	-18.65	43.17	70.00	26.83
6	1160.000	44.74	AVG	-18.65	26.09	50.00	23.91

Condition: EN 301 489 Class B
Test Mode: M1
Note: 2AFL-1(230V)

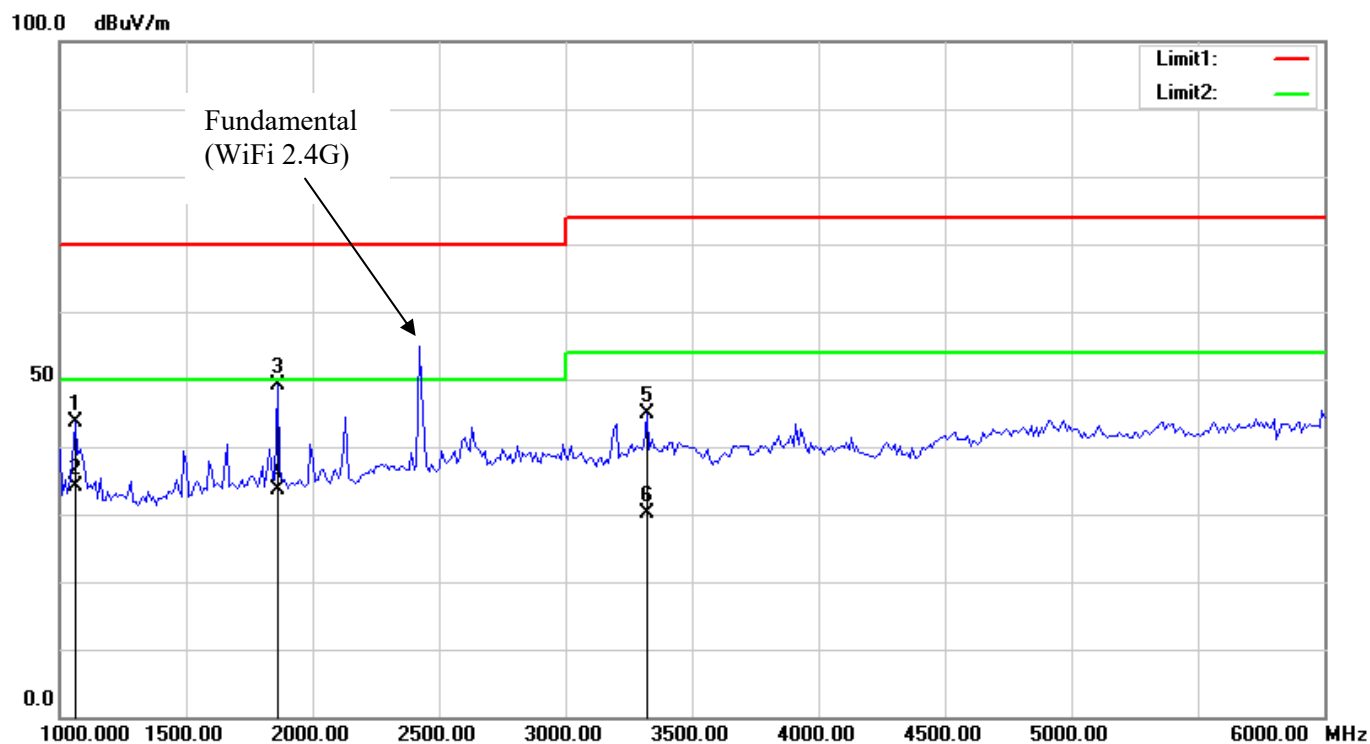
Polarization: Horizontal
Distance: 3m
Power Source: AC 230V/50Hz



No.	Frequency	Reading	Detector	Corrected	Result	Limit	Margin
	(MHz)	(dBμV)		(dB/m)	(dBμV/m)	(dBμV/m)	(dB)
1	1990.000	55.94	peak	-15.87	40.07	70.00	29.93
2	1990.000	43.92	AVG	-15.87	28.05	50.00	21.95
3	3860.000	51.27	peak	-9.93	41.34	74.00	32.66
4	3860.000	40.56	AVG	-9.93	30.63	54.00	23.37
5	4930.000	51.65	peak	-7.73	43.92	74.00	30.08
6	4930.000	40.47	AVG	-7.73	32.74	54.00	21.26

Condition: EN 301 489 Class B
Test Mode: M1
Note: 2AFL-1(230V)

Polarization: Vertical
Distance: 3m
Power Source: 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	1060.000	62.87	peak	-19.19	43.68	70.00	26.32
2	1060.000	53.31	AVG	-19.19	34.12	50.00	15.88
3	1860.000	65.27	peak	-16.21	49.06	70.00	20.94
4	1860.000	49.82	AVG	-16.21	33.61	50.00	16.39
5	3320.000	56.17	peak	-11.23	44.94	74.00	29.06
6	3320.000	41.42	AVG	-11.23	30.19	54.00	23.81

3 - AC MAINS 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:

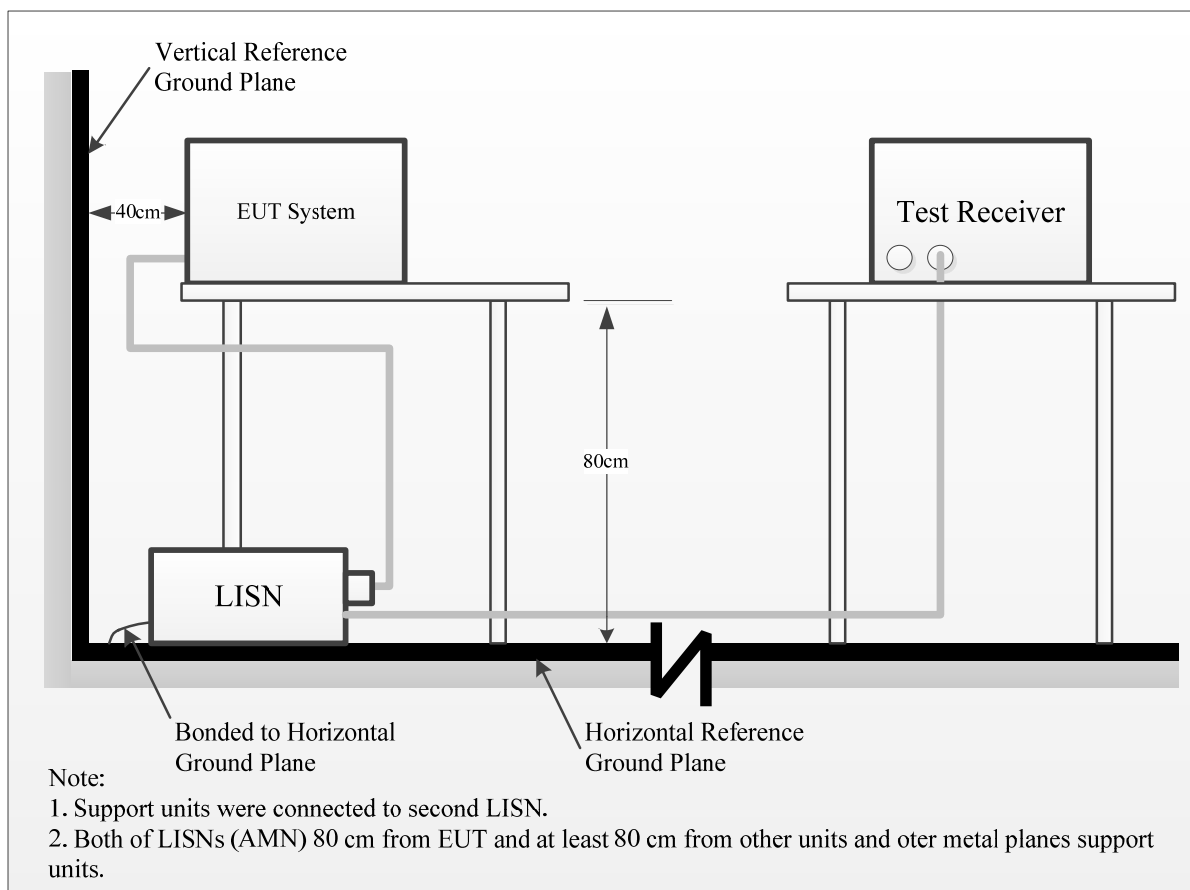
- compliance is deemed to occur if no measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level, increased by $(U_{lab} - U_{cispr})$, exceeds the disturbance limit.

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



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 AC 230V/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:

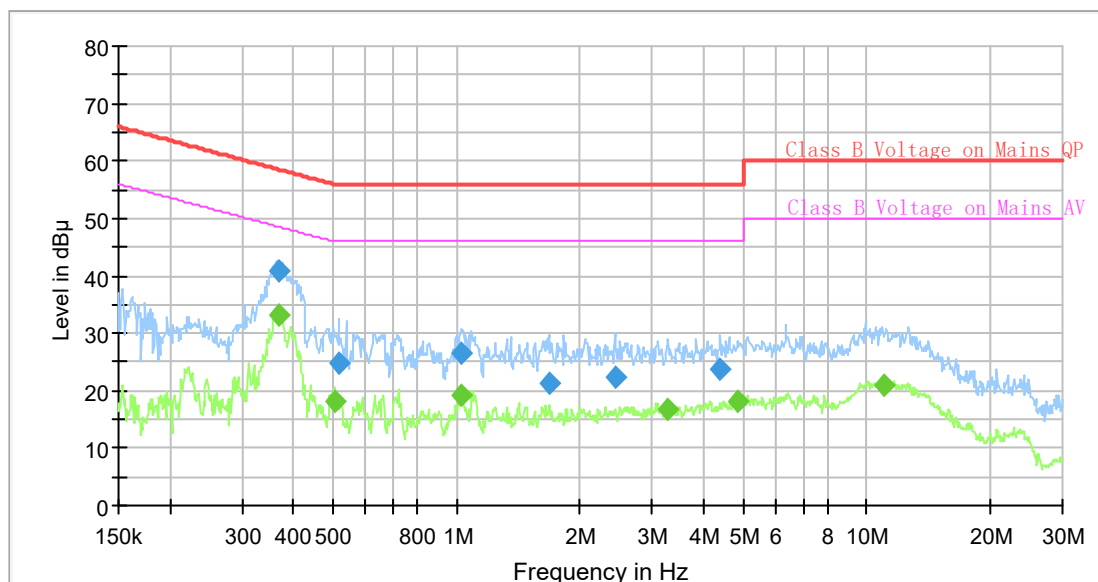
Corr. = Cable loss + Factor of coupling device

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:

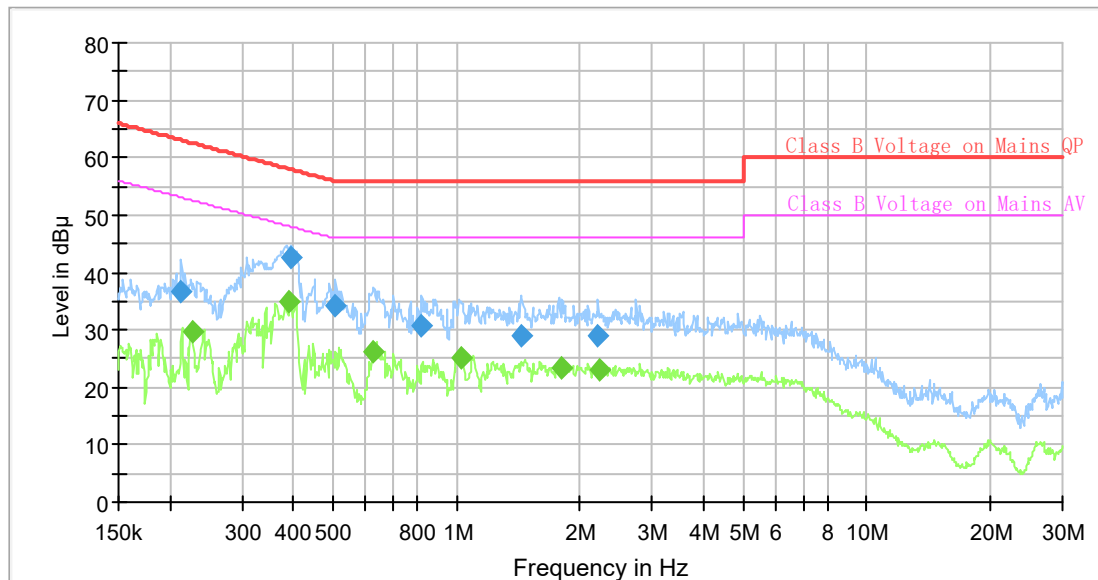
Port: L
Test Mode: M1
Power Source: AC 110V/60Hz
Note: 2AFL-1



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.368114	---	33.22	48.54	15.32	9.000	L1	9.6
0.369955	40.71	---	58.50	17.79	9.000	L1	9.6
0.504016	---	18.03	46.00	27.97	9.000	L1	9.6
0.516743	24.78	---	56.00	31.22	9.000	L1	9.6
1.028469	---	19.04	46.00	26.96	9.000	L1	9.7
1.028469	26.50	---	56.00	29.50	9.000	L1	9.7
1.685121	21.38	---	56.00	34.62	9.000	L1	9.7
2.437361	22.38	---	56.00	33.62	9.000	L1	9.7
3.287634	---	16.67	46.00	29.33	9.000	L1	9.7
4.390511	23.70	---	56.00	32.30	9.000	L1	9.7
4.826922	---	18.26	46.00	27.74	9.000	L1	9.7
11.046800	---	20.98	50.00	29.02	9.000	L1	9.9

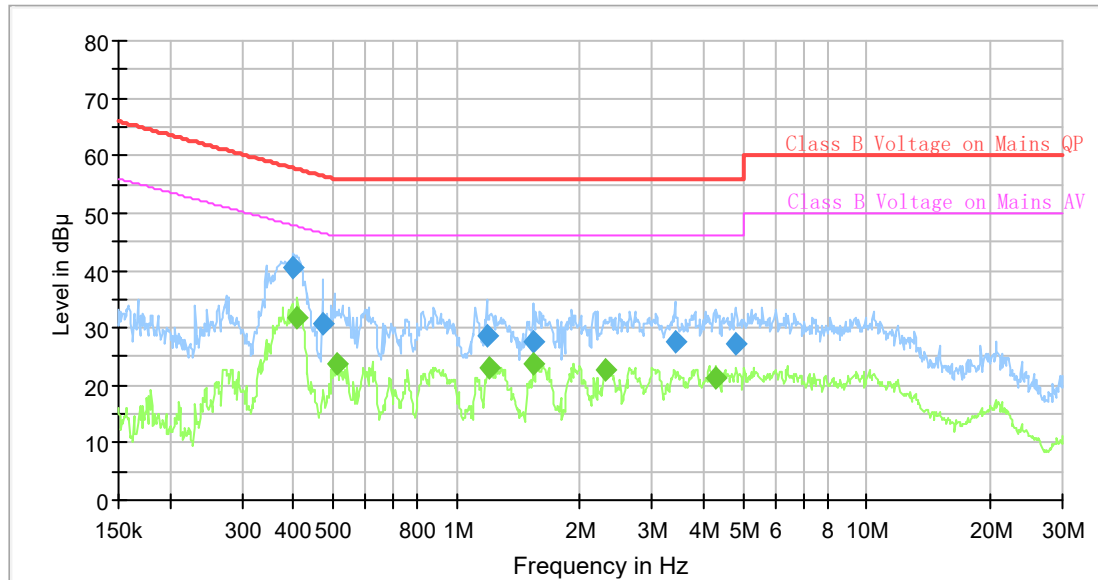
Port: N
Test Mode: M1
Power Source: AC 110V/60Hz
Note: 2AFL-1



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.213738	36.56	---	63.06	26.50	9.000	N	9.6
0.226921	---	29.82	52.56	22.74	9.000	N	9.6
0.390819	---	34.94	48.05	13.11	9.000	N	9.6
0.396710	42.69	---	57.92	15.23	9.000	N	9.6
0.506536	34.18	---	56.00	21.82	9.000	N	9.6
0.627698	---	26.26	46.00	19.74	9.000	N	9.6
0.821710	30.66	---	56.00	25.34	9.000	N	9.6
1.023352	---	25.12	46.00	20.88	9.000	N	9.6
1.436538	29.16	---	56.00	26.84	9.000	N	9.6
1.806991	---	23.33	46.00	22.67	9.000	N	9.6
2.216994	29.17	---	56.00	26.83	9.000	N	9.6
2.228079	---	23.01	46.00	22.99	9.000	N	9.6

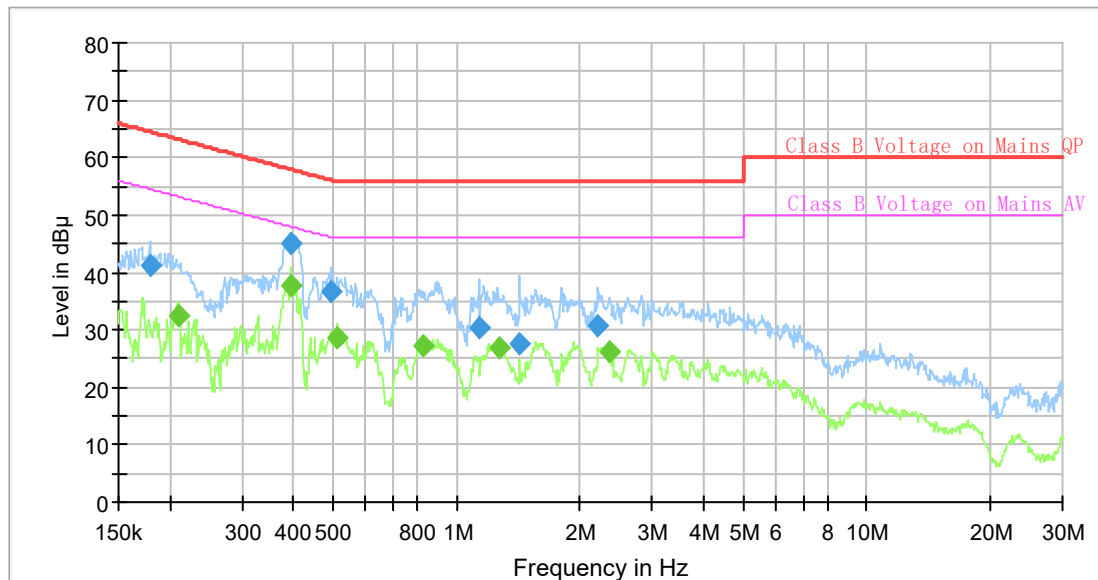
Port: L
 Test Mode: M1
 Power Source: AC 230V/50Hz
 Note: 2AFL-1



Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.400687	40.68	---	57.84	17.16	9.000	L1	9.6
0.408761	---	31.65	47.67	16.02	9.000	L1	9.6
0.472373	30.59	---	56.47	25.88	9.000	L1	9.6
0.509069	---	23.70	46.00	22.30	9.000	L1	9.6
1.182608	28.74	---	56.00	27.26	9.000	L1	9.7
1.200436	---	23.02	46.00	22.98	9.000	L1	9.7
1.540430	27.53	---	56.00	28.47	9.000	L1	9.7
1.540430	---	23.79	46.00	22.21	9.000	L1	9.7
2.307242	---	22.62	46.00	23.38	9.000	L1	9.7
3.404442	27.67	---	56.00	28.33	9.000	L1	9.7
4.303788	---	21.34	46.00	24.66	9.000	L1	9.7
4.779012	27.29	---	56.00	28.71	9.000	L1	9.7

Port: N
Test Mode: M1
Power Source: AC 230V/50Hz
Note: 2AFL-1

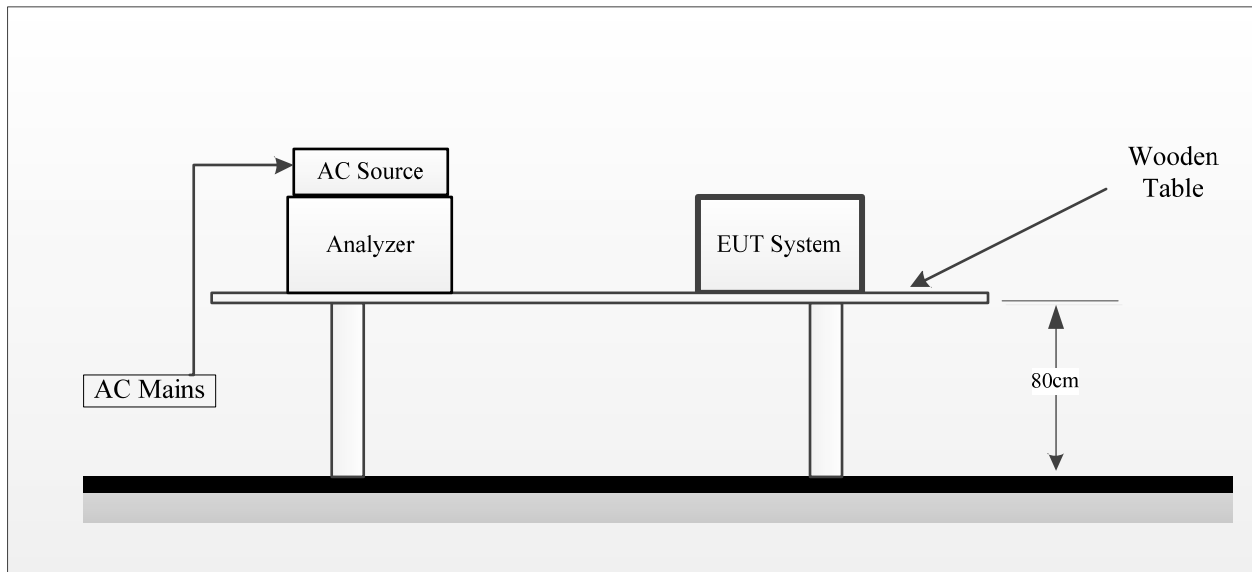


Final Result

Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Bandwidth (kHz)	Line	Corr. (dB)
0.178609	41.24	---	64.55	23.31	9.000	N	9.6
0.209516	---	32.65	53.22	20.57	9.000	N	9.6
0.394736	---	37.61	47.96	10.35	9.000	N	9.6
0.394736	45.06	---	57.96	12.90	9.000	N	9.6
0.496531	36.80	---	56.06	19.26	9.000	N	9.6
0.511614	---	28.73	46.00	17.27	9.000	N	9.6
0.829947	---	27.40	46.00	18.60	9.000	N	9.6
1.136351	30.38	---	56.00	25.62	9.000	N	9.6
1.274476	---	27.00	46.00	19.00	9.000	N	9.6
1.422280	27.54	---	56.00	28.46	9.000	N	9.6
2.216994	30.62	---	56.00	25.38	9.000	N	9.6
2.365502	---	26.17	46.00	19.83	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 P_{st} 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 d_{max} , 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 P_{st} and Plt limit. For example: a d_{max} 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. P_{st} 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
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 [%]	0.006	3.30	PASS
dmax [%]	0.204	4.00	PASS
dt [s]	0.000	0.50	PASS

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

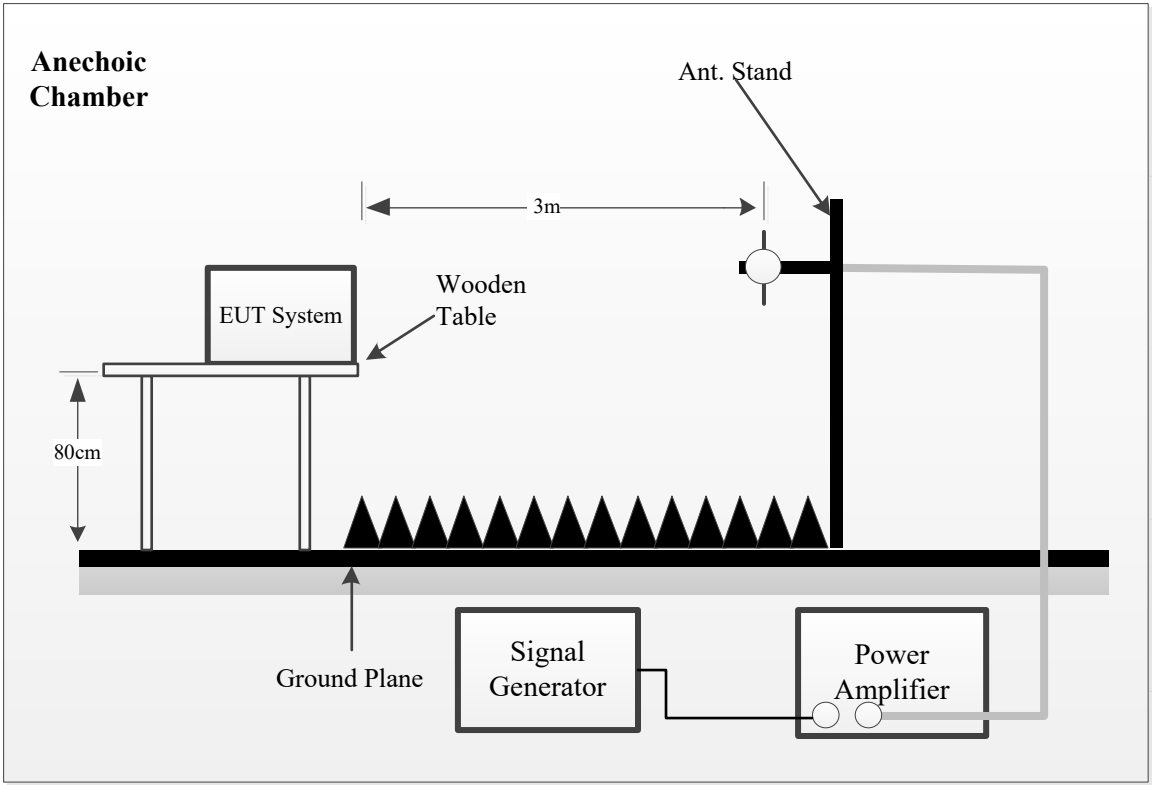
Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-3) please refer to the following:

Parameter	U_{EN}	U_{lab}
Calibration process	1.88 dB	1.88 dB
Level setting	2.19 dB	2.19 dB

Note: 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.

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 this antenna and measured individually.

In order to judge the EUT performance, a CCD camera, CWM500 were used to monitor the EUT.

Test Data

Please refer to following tables:

Test Mode: M1

Note:

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

Table 1: Radiated RF-Electromagnetic Field Immunity, Swept Test

Frequency Range (MHz)	Front Side		Rear Side		Left Side		Right Side		Top Side		Bottom Side	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-1000	A	A	A	A	A	A	A	A	A	A	A	A
1000-6000	A	A	A	A	A	A	A	A	A	A	A	A
Required Performance Criteria: A												
Description of Performance reduction: N/A												

8 - ELECTROSTATIC DISCHARGES

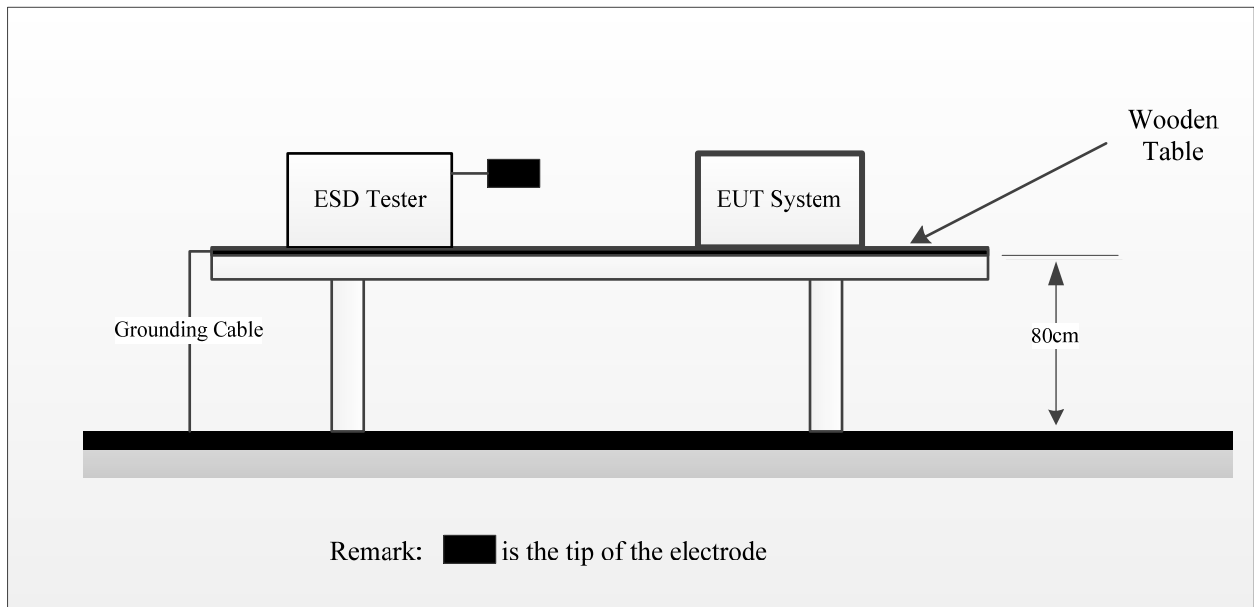
Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-2) please refer to the following:

Parameter	U_{EN}	U_{lab}
Rise time t_r	$\leq 15\%$	15%
Peak current I_p	$\leq 7\%$	6.3%
Current at 30 ns	$\leq 7\%$	6.3%
Current at 60 ns	$\leq 7\%$	6.3%

Note: 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.

Test System Setup



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

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 IEC 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 10 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 10 single discharges shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions $0.5\text{m} \times 0.5\text{m}$, 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

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	/	/
Seam	A	A	A	A	A	A	/	/
Required Performance Criteria:B								
Description of Performance reduction: N/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
/	/	/	/	/	/	/	/	/
Required Performance Criteria:B								
Description of Performance reduction: N/A								

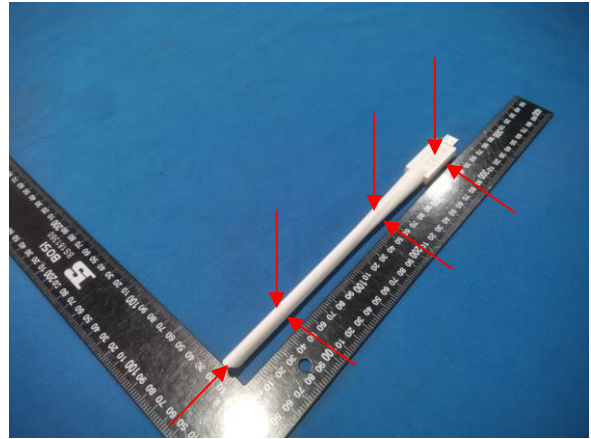
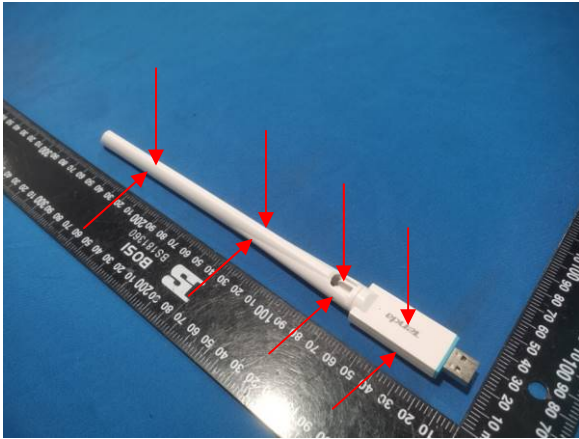
Table 3: Electrostatic Discharge Immunity (Indirect Contact HCP)


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	/	/	/	/
Top Side	A	A	A	A	/	/	/	/
BottomSide	A	A	A	A	/	/	/	/
Required Performance Criteria:B								
Description of Performance reduction: N/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	/	/	/	/
Required Performance Criteria:B								
Description of Performance reduction: N/A								

ESD Location Photo



Air Discharge: 

Direct Contact: 

9 - FAST TRANSIENTS, COMMON MODE

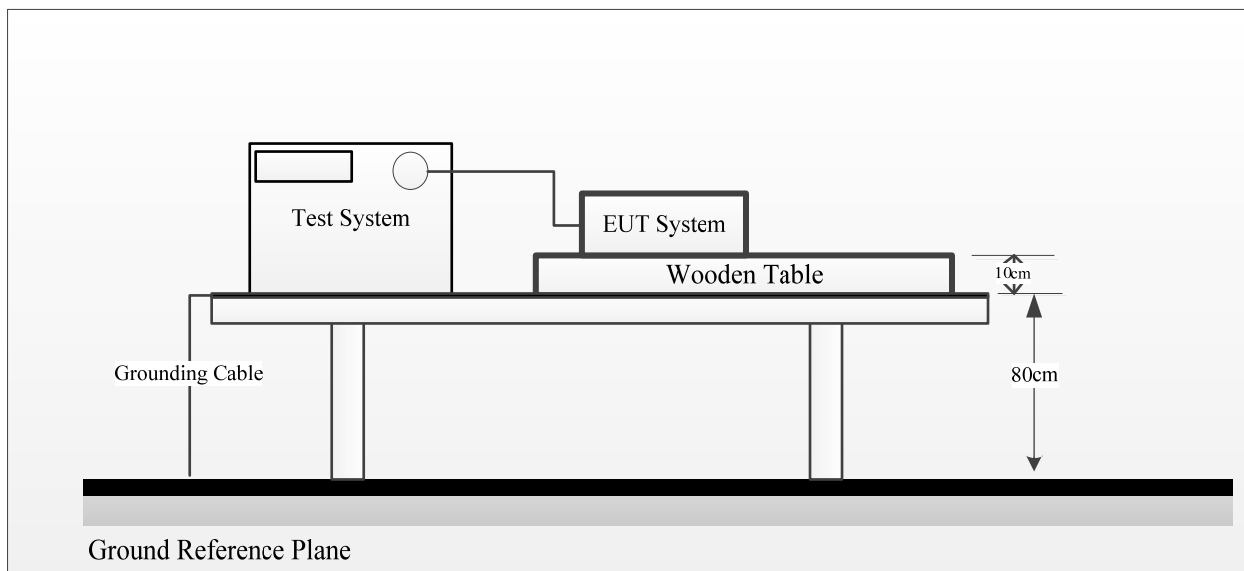
Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-2) please refer to the following:

Parameter	U_{EN}	U_{lab}
Rise time t_r	$\leq 15\%$	15%
Peak current I_p	$\leq 7\%$	6.3%
Current at 30 ns	$\leq 7\%$	6.3%
Current at 60 ns	$\leq 7\%$	6.3%

Note: 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.

Test System Setup



Test Level

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

Note:

AC Mains Power Input Ports

Test Points	Test Level (kV)							
	+0.5	-0.5	+1.0	-1.0	+2.0	-2.0	+4.0	-4.0
L	A	A	A	A	/	/	/	/
N	A	A	A	A	/	/	/	/
Earth	A	A	A	A	/	/	/	/
L+N	A	A	A	A	/	/	/	/
L + Earth	A	A	A	A	/	/	/	/
N + Earth	A	A	A	A	/	/	/	/
L+N+Earth	A	A	A	A	/	/	/	/
Required Performance Criteria: B								
Description of Performance reduction: N/A								

10 - RADIO FREQUENCY, COMMON MODE

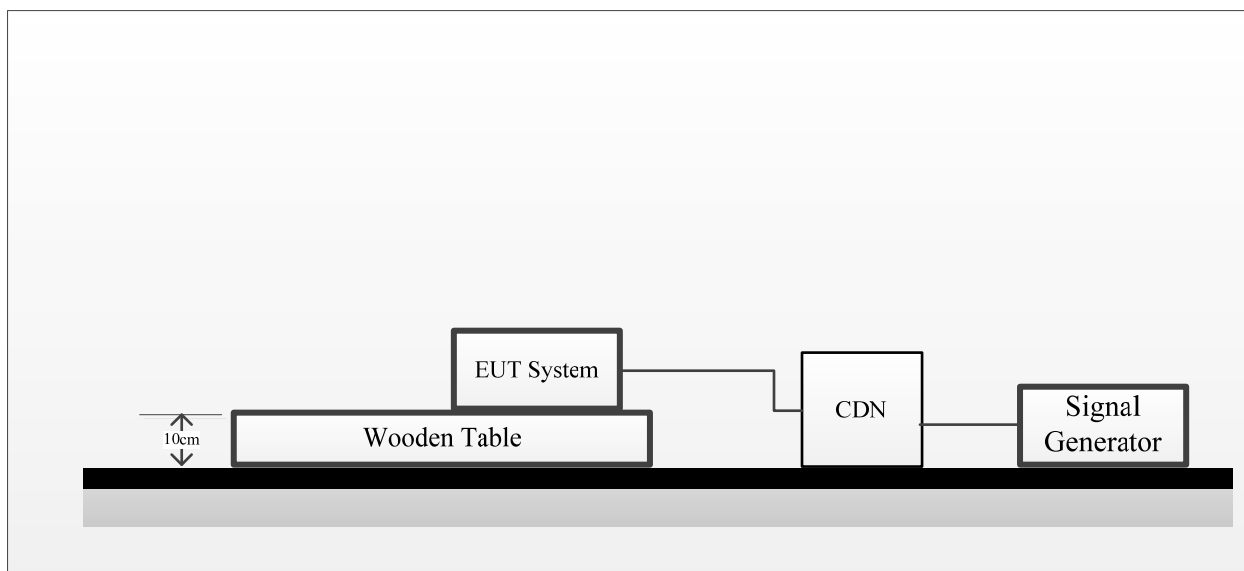
Measurement Uncertainty

U_{lab} (measurement uncertainty of lab) and U_{EN} (measurement uncertainty of EN 61000-4-6) please refer to the following:

Parameter	U_{EN}	U_{lab}
CDN calibration process	1.27 dB	1.27 dB
CDN test process	1.36 dB	1.36 dB

Note: 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.

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

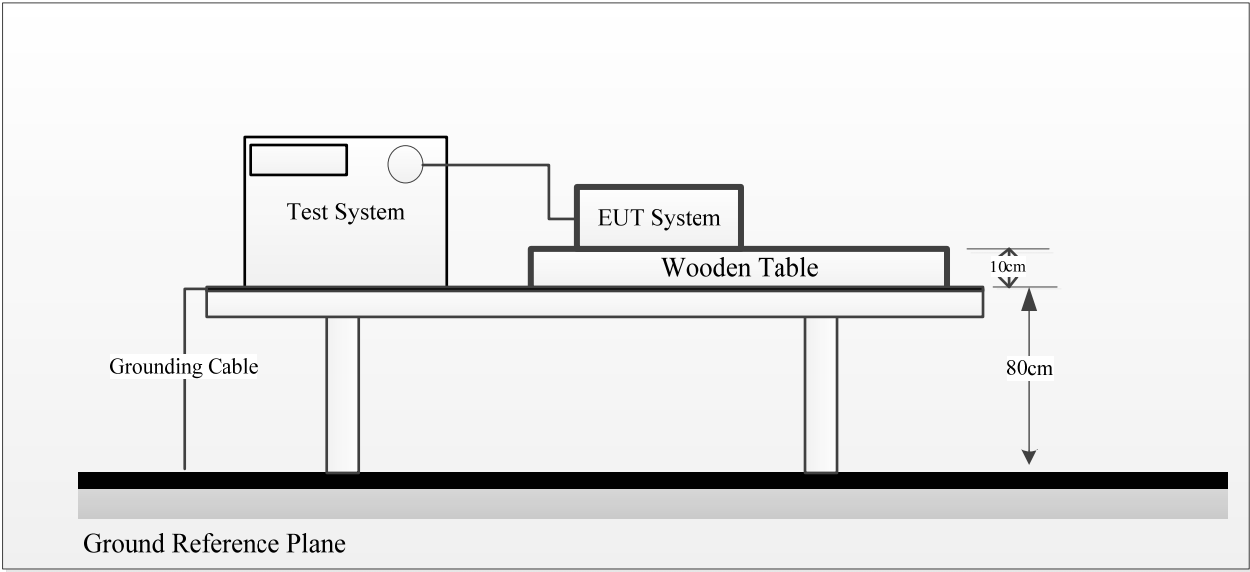
Note:

Table 1: AC mains power input port

Signal Type	Frequency Range (MHz)	Voltage Level (r.m.s.)	Perform Criterion
Modulation: Amplitude 80%, 1kHz sine wave Dwell Time 1 Sec	0.15-80	3V	A
Required Performance Criteria: A Description of Performance reduction: N/A			

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	B
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

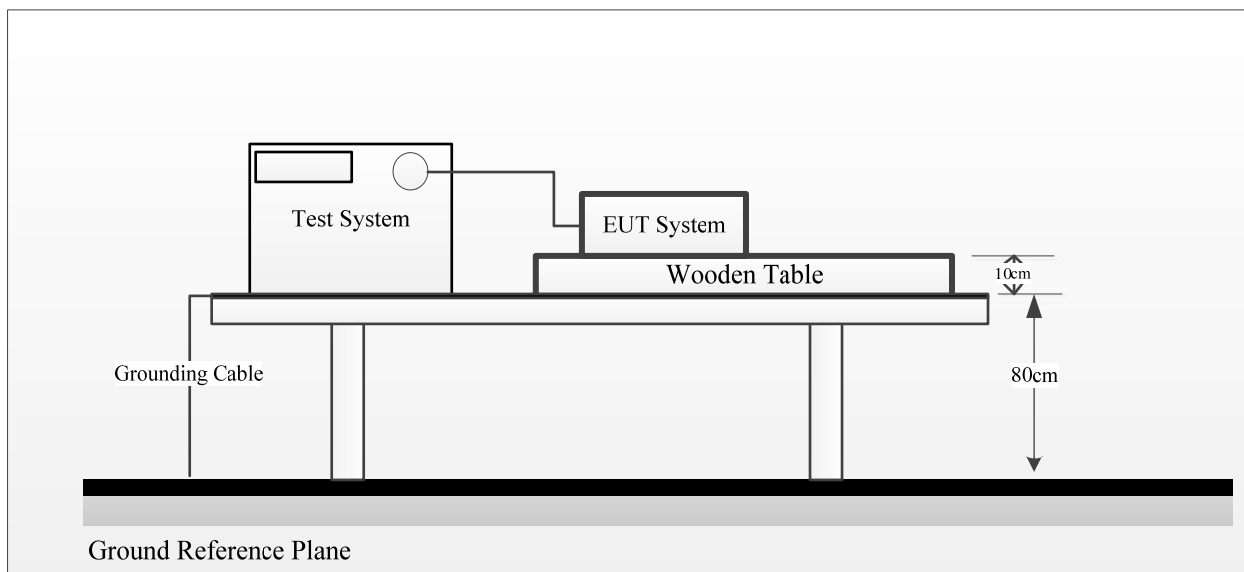
Note:

Table 1: Voltage Dips/Interruptions Test

Residual Voltage (%)	Td (Number of cycles)	Phase Angle (°)	N	Result	Required Performance Criteria
0	0.5	0/90/180/270	3	A	B
0	1	0/90/180/270	3	A	B
70	25	0/90/180/270	3	A	C
0	250	0/90/180/270	3	A	C
Description of Performance reduction: N/A					

13 - SURGES

Test System Setup



Test Level

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

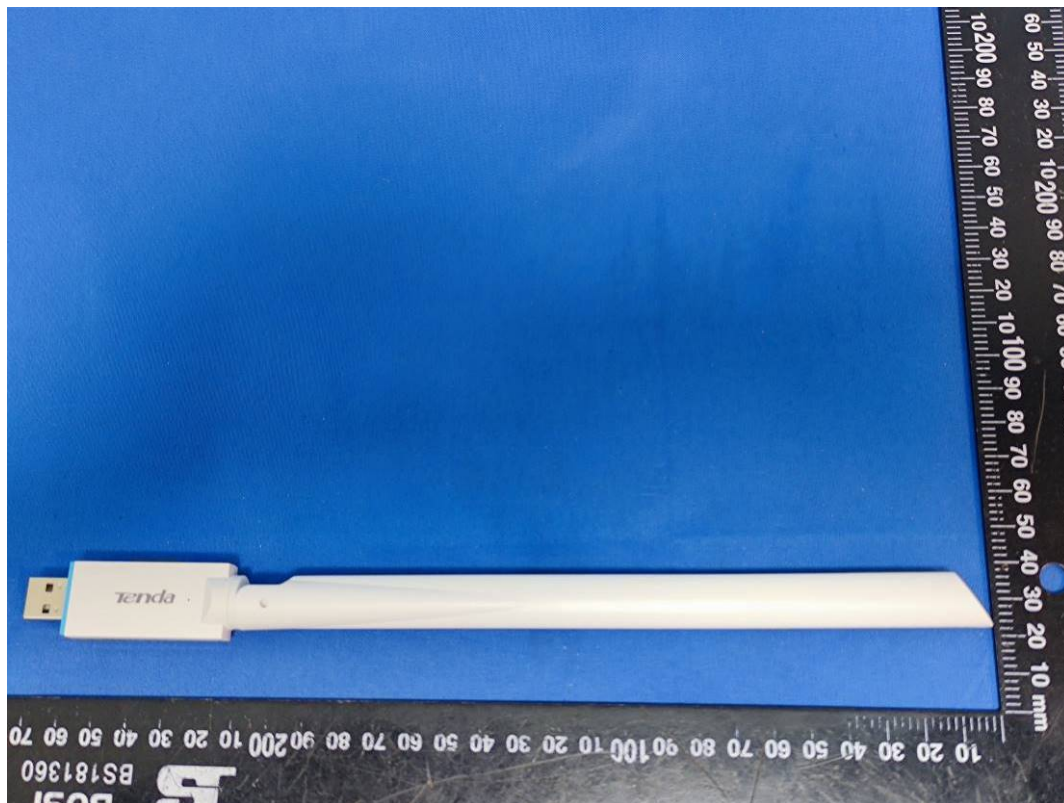
Note:

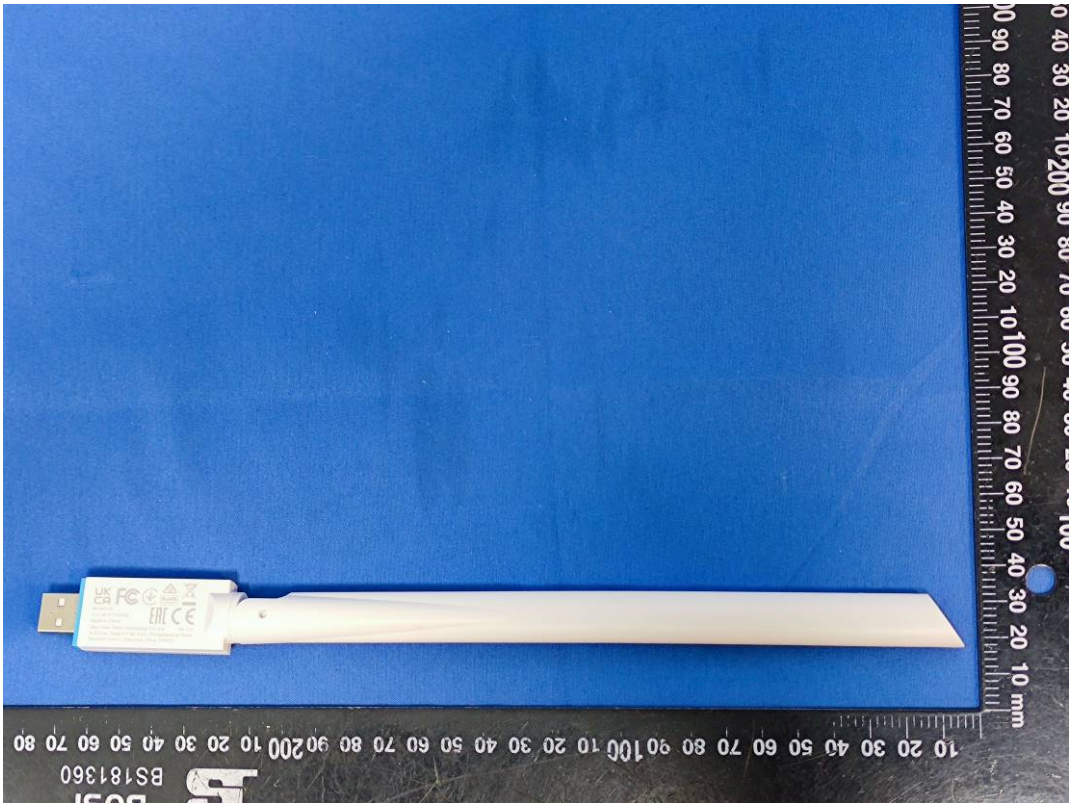
Table 1: AC mains power input port

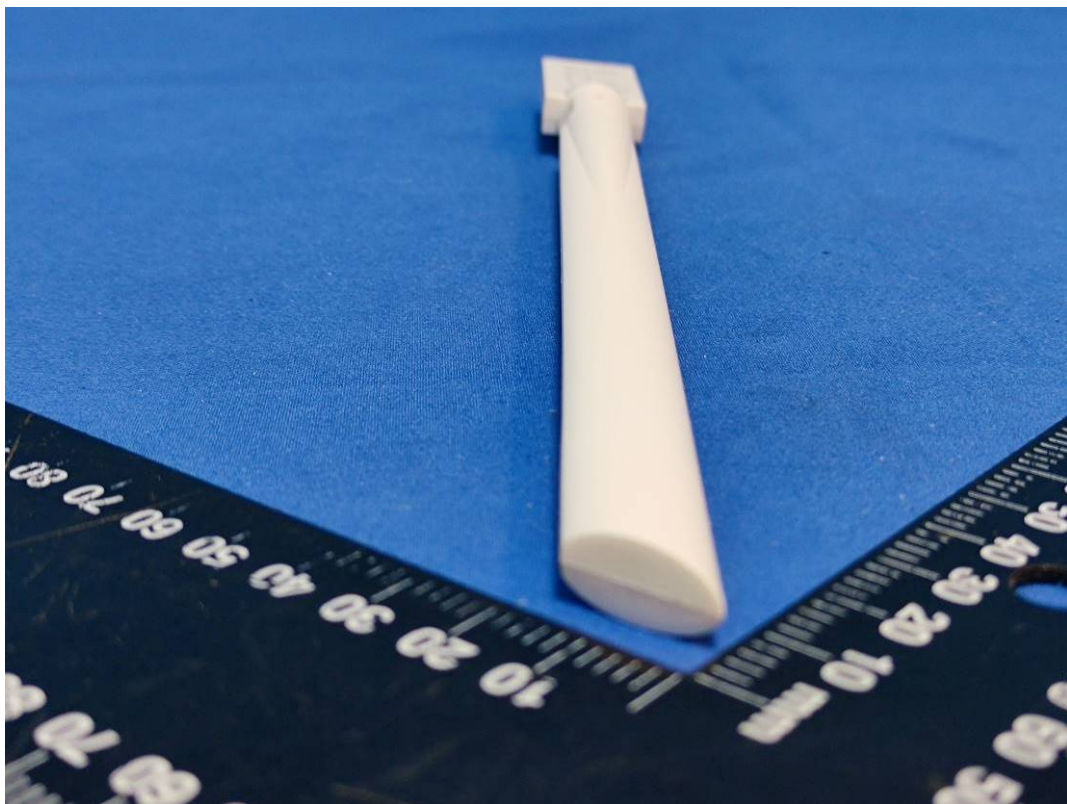
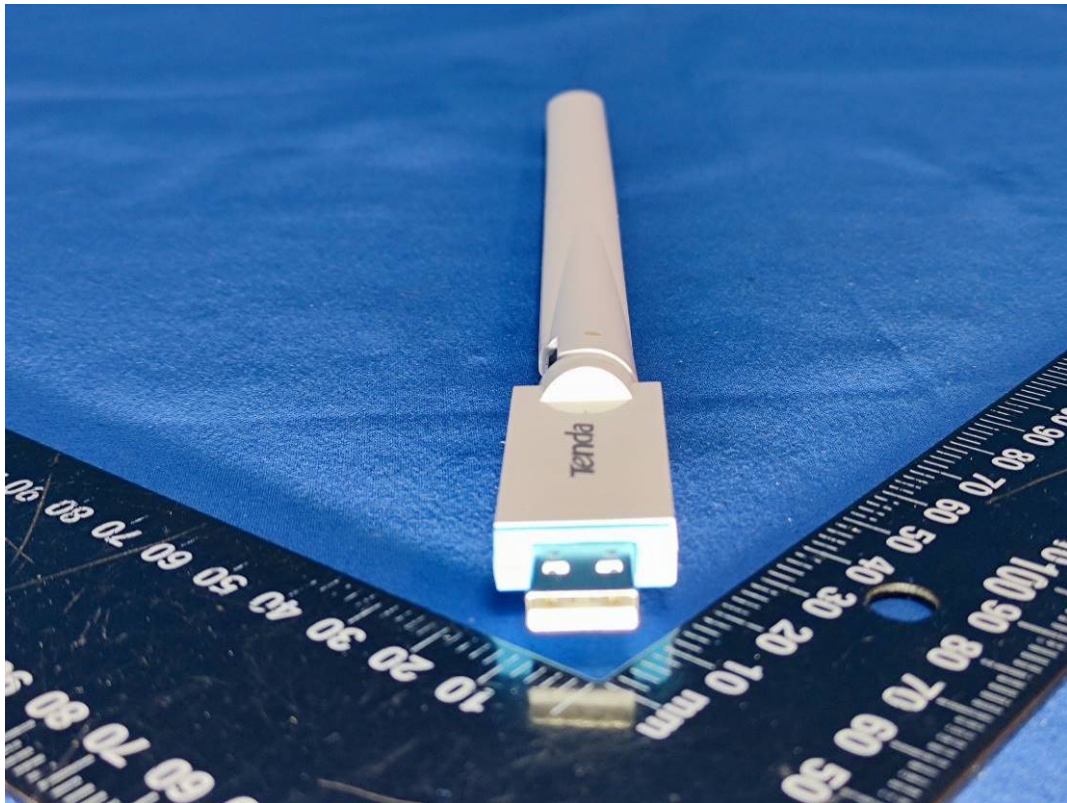
Level	Voltage	Poll	Path	Phase Angle	Perform Criterion
1	0.5kV	+	L- N, L-G	0/90/180/270	A
1	0.5kV	-	L- N, L-G	0/90/180/270	A
1	0.5kV	+	N-G	0/90/180/270	A
1	0.5kV	-	N-G	0/90/180/270	A
2	1kV	+	L- N, L-G	0/90/180/270	A
2	1kV	-	L- N, L-G	0/90/180/270	A
2	1kV	+	N-G	0/90/180/270	A
2	1kV	-	N-G	0/90/180/270	A
3	2kV	+	L-G	0/90/180/270	A
3	2kV	-	L-G	0/90/180/270	A
3	2kV	+	N-G	0/90/180/270	A
3	2kV	-	N-G	0/90/180/270	A
Required Performance Criteria: B					
Description of Performance reduction: N/A					

EXHIBITA - EUT PHOTOGRAPHS

EUT

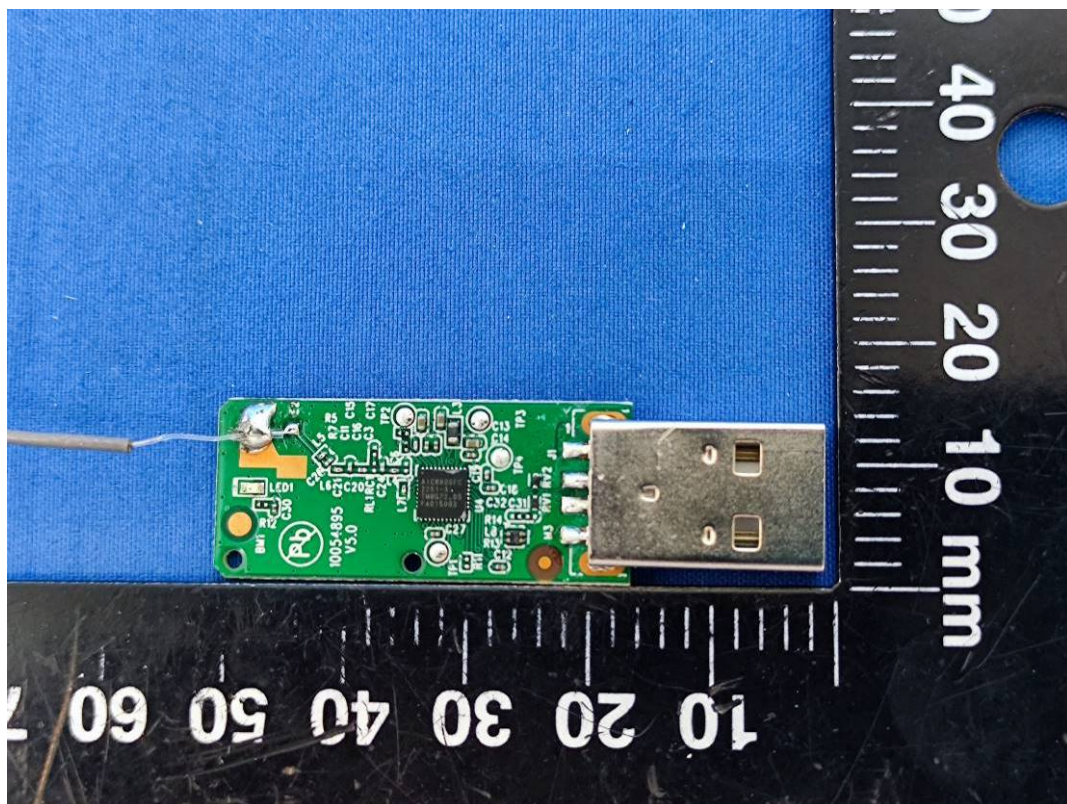




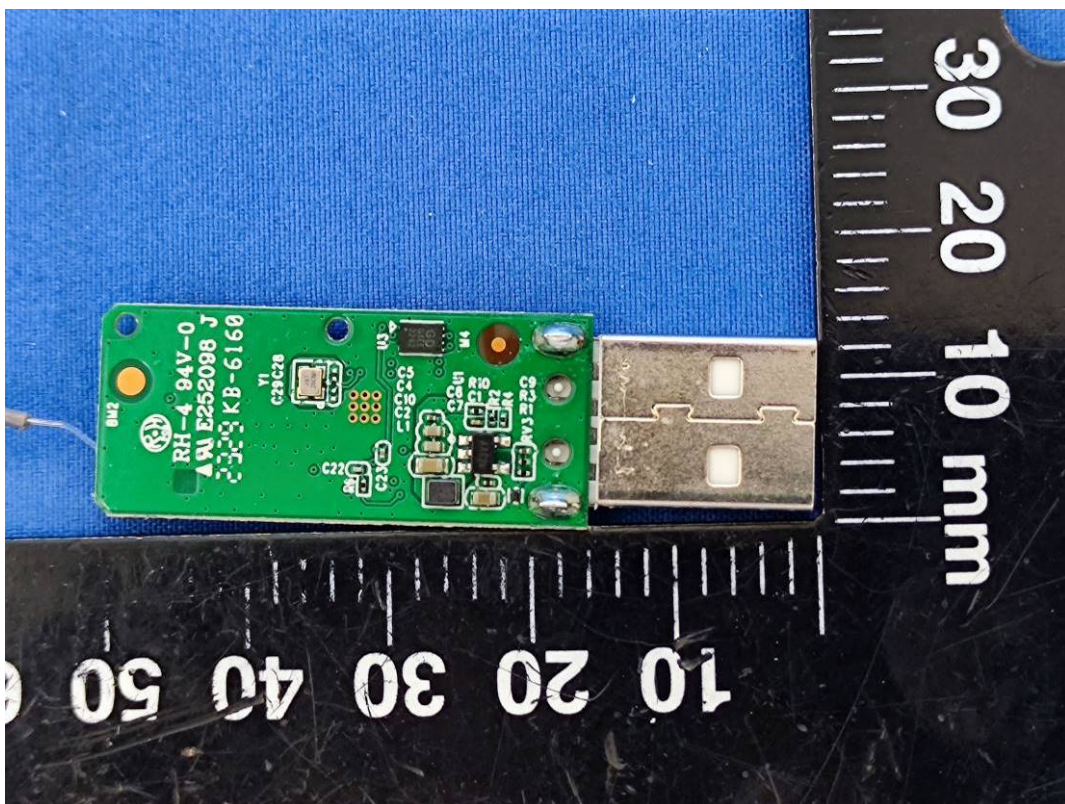
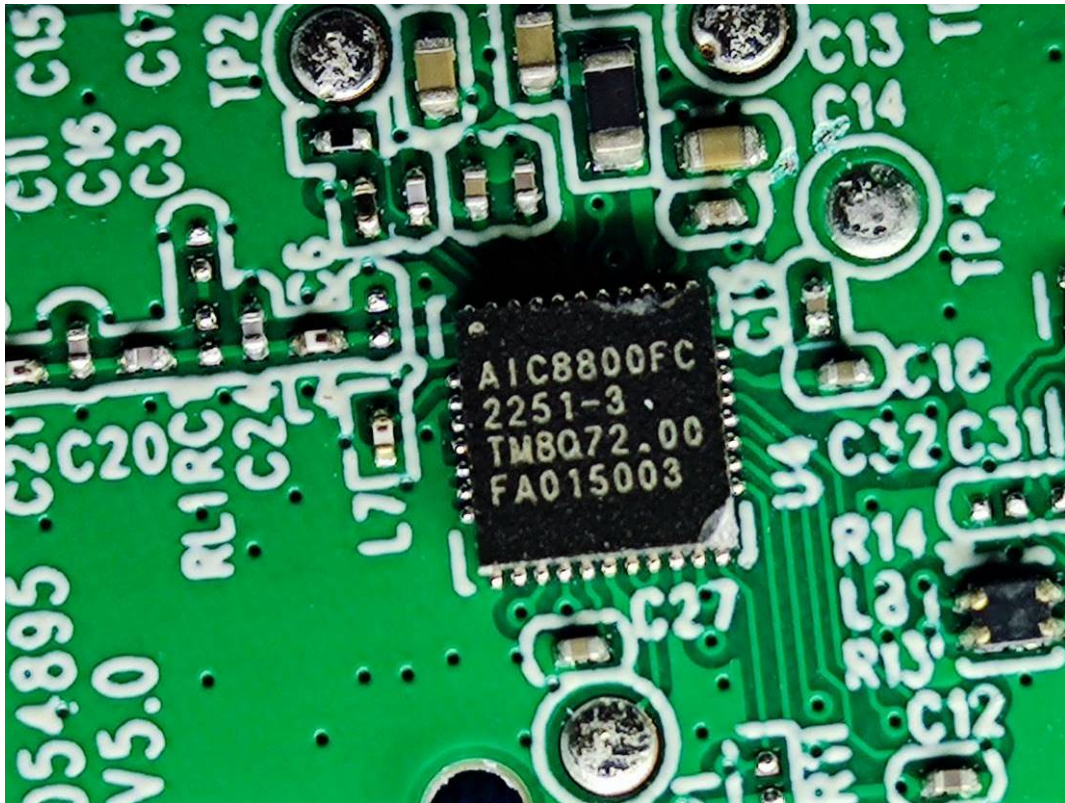




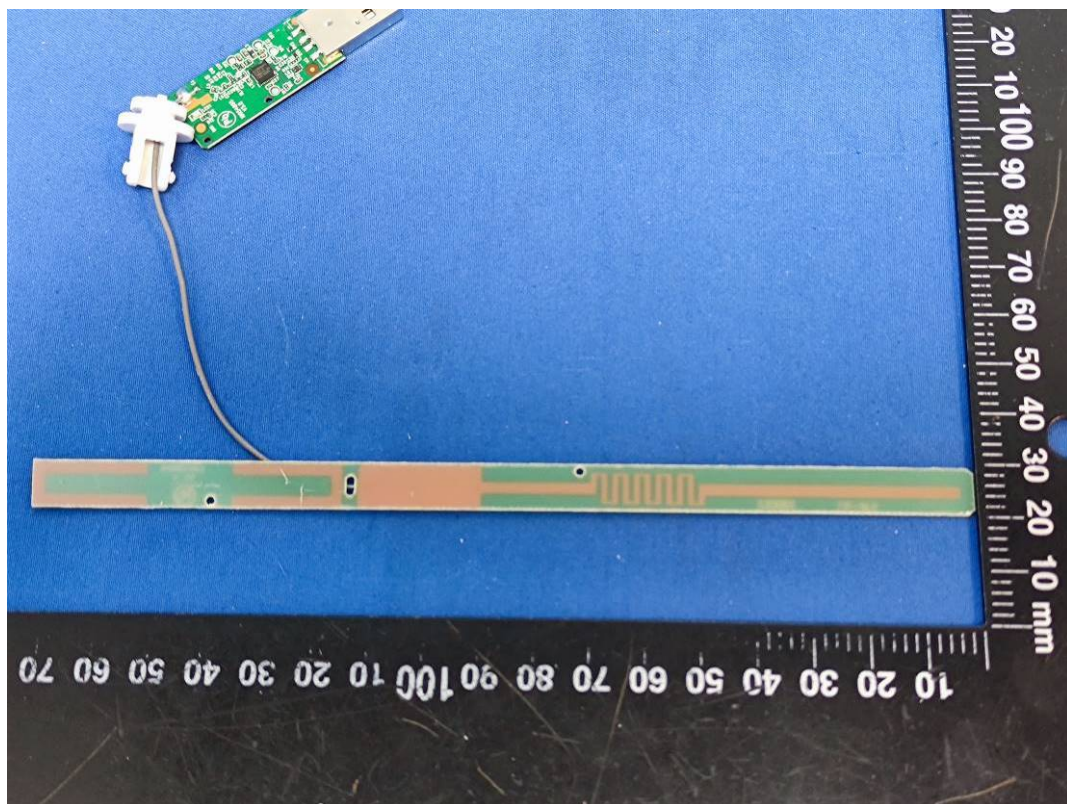
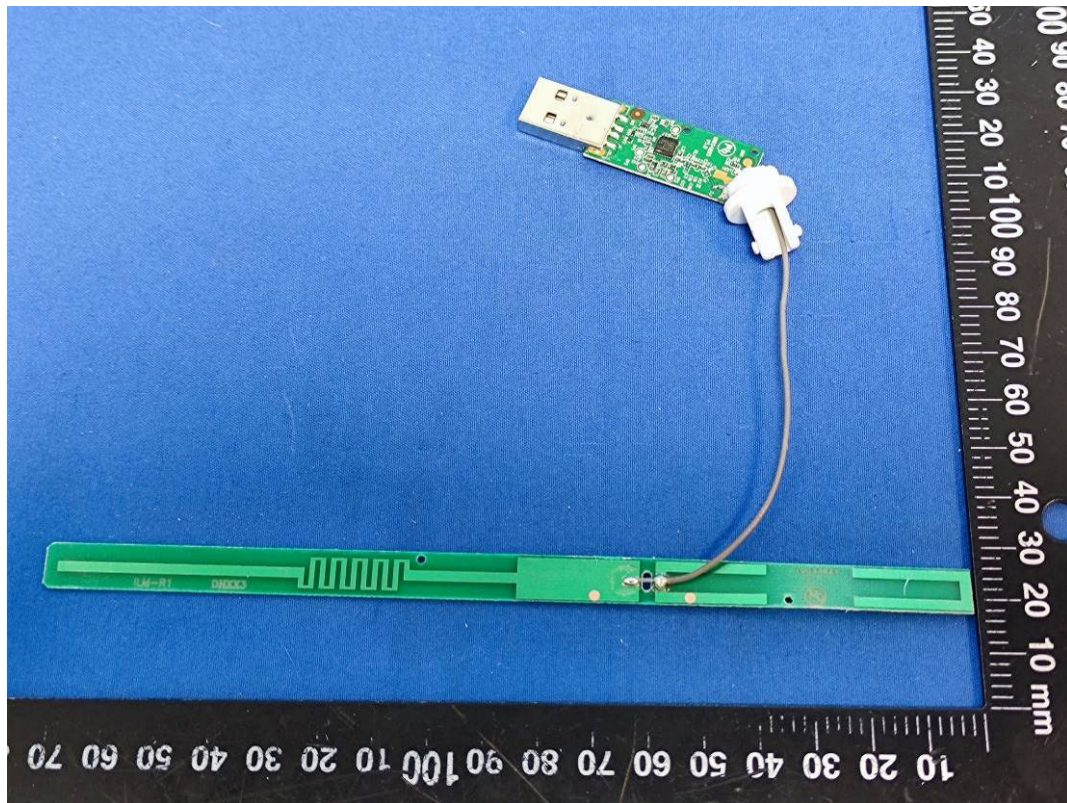
Uncover



Chip



Antenna



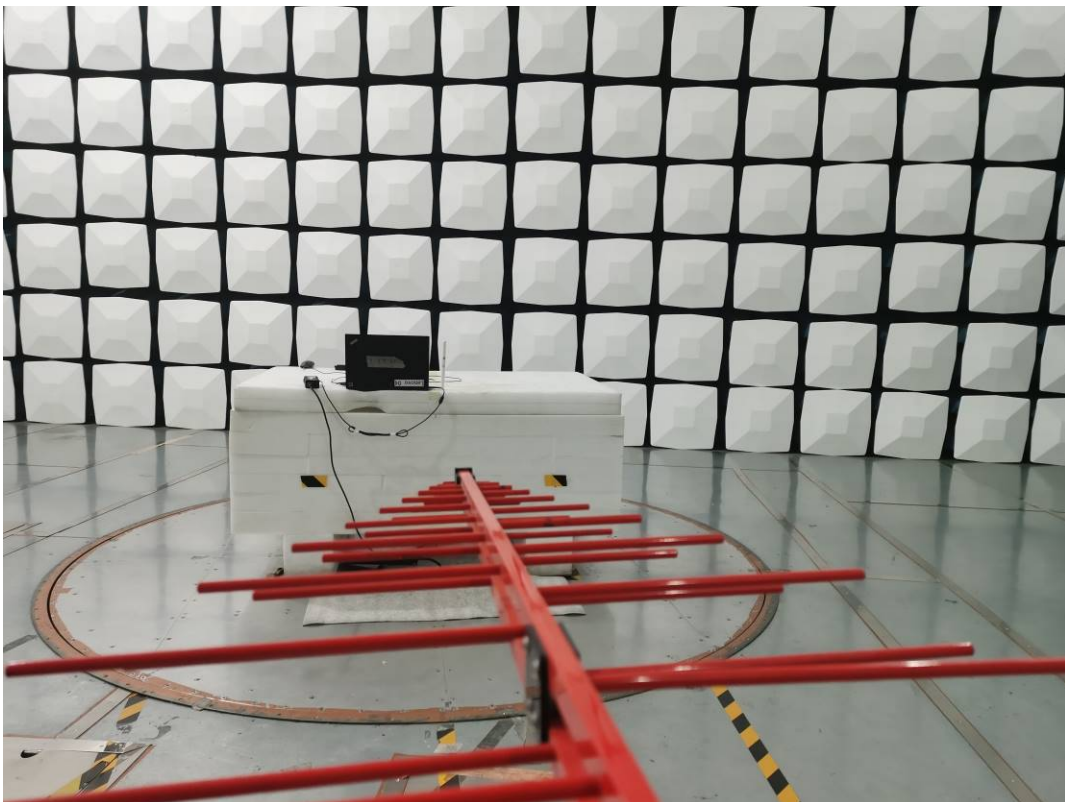
EXHIBITB - TEST SETUP PHOTOGRAPHS

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



Flicker

Test Setup Photo View



RS

Test Setup Photo View



ESD

Test Setup Photo View



EFT

Test Setup Photo View



Dips

Test Setup Photo View



Surge

Test Setup Photo View



CS

Test Setup Photo View



****END OF REPORT****