Test Report

Report No.: SAIL221121943E079

Date of issue: November 29, 2022

Sample description:	Motherboard
Model(s):	AIoT3568,DS3288-A,DS3288-B,DS133,DS3566,DS960X,DS3128,AIoT3568-X, AIoT3568-V, AIoT3399-X, AI3399-C, AIoT3588
Applicant:	Nanjing Signway Technology Co.,Ltd.
Address:	5th Floor, Building 3, No. 30, Fengzhan Road, Yuhuatai District, Nanjing
Date of test:	November 21, 2022 – November 29, 2022

Shenzhen SAIL Testing Technology Co.,Ltd
www.sail-lab.cn

E-Mail：sail006@sail-lab.cn TEL：+86 755-23288964 www.sail-lab.cn
Address: Room 416, 4 / F, Miyungu AI Center, Block B, Wuzhou Xintiandi, 6038 Longgang Avenue,Shenzhen,P.R.China

Table of Contents

Test Result Certification	
Applicant's name:	Nanjing Signway Technology Co.,Ltd.
Address:	5th Floor, Building 3, No. 30, Fengzhan Road, Yuhuatai District, Nanjing
Manufacture's name:	Nanjing Signway Technology Co.,Ltd.
Address:	5th Floor, Building 3, No. 30, Fengzhan Road, Yuhuatai District, Nanjing
Factory:	Nanjing Signway Technology Co.,Ltd.
Address:	5th Floor, Building 3, No. 30, Fengzhan Road, Yuhuatai District, Nanjing
Product name:	Motherboard
Trademark:	SIGNWAY
Model name:	AIoT3568
Series model:	DS3288-A,DS3288-B,DS133,DS3566,DS960X,DS3128,AIoT3568-X, AIoT3568-V, AIoT3399-X, AI3399-C, AIoT3588
Difference in series models:	N/A
Standards:	EN 301 489-1 V2.2.3 (2019-11) (Draft) EN 301 489-17 V3.2.2 (2019-12)

This device described above has been tested by Shenzhen SAIL Testing Technology Co.,Ltd and the test results show that the equipment under test (EUT) is in compliance with the Radio equipment directive requirements. And it is applicable only to the tested sample identified in the report.

Test Engineer: Chael Liang

Chacl Liang November 29, 2022

Authorize Signatory: Mars Zhang

Mars Zhang November 29, 2022

Summary of Test Result

Item	Description of Test	Result
EMC emission		
1	Conducted emission	Pass
2	Radiated emission	Pass
3	Harmonic current emission	N/A*
4	Voltage fluctuations &flicker	Pass
Immunity		
1	Electrostatic discharge immunity (ESD)	Pass
2	Radiated electromagnetic field immunity(RS)	Pass
3	Fast transients / burst immunity (EFT)	Pass
4	Surge immunity	Pass
5	Conducted disturbance immunity (CS)	Pass
6	Voltage interruptions &voltage Dips immunity	Pass

*Not Applicable.

1 General description

1.1 Feature of equipment under test (EUT)

Product name:	Motherboard
Model name:	AIoT3568
Rating Input:	12V ⎓ 3A
Antenna designation:	0dBi
Battery:	
Specification:	Model:AIoT3568,DS3288-A,DS3288-B,DS133,DS3566,DS960X,DS3128,AIoT3568-X, AIoT3568-V, AIoT3399-X, AI3399-C, AIoT3588
Tx/Rx frequency range:	87KHz-205KHz

1.2 Test mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Pretest Mode	Description
Mode 1	Charging
Mode 2	Cleanning

For Conducted Test	
Final Test Mode	Description
Mode 1	Charging

For Radiated Test	
Final Test Mode	Description
Mode 1	Cleanning

For EMS Test	
Final Test Mode	Description
Mode 1	Charging
Mode 2	Cleanning

NOTE: The test modes were carried out for all operation modes. The final test mode of the EUT was the worst test mode for EMI, and its test data was showed.

1.3 Test conditions

During the measurement the environmental conditions were within the listed ranges:

- Temperature: 15ºC~35ºC
- Humidity: 20%~75% (30%~60% for ESD test)
- Atmospheric pressure: 98kPa~101kPa

1.4 Ancillary equipment list

Equipment	Model	S/N	Manufacturer
Laptop	E485	/	DONGGUAN HUMEN YONGXIN ELECTRONICS FACTORY
DC source	/	/	/

1.5 Measurement Uncertainty

Measurement Uncertainty for a Level of Confidence of 95 %, U=2xUc(y)

Conducted emission(150kHz~30MHz)	± 2.5 dB
Radiated emission(30MHz~1GHz)	± 4.2 dB
Radiated emission (above 1GHz)	± 4.3 dB
Temperature	±1 degree
Humidity	± 5 %

2 Testing site

Test laboratory:	Shenzhen SAIL Testing Technology Co.,Ltd
Laboratory location:	Room 416, 4 / F, Miyungu AI Center, Block B, Wuzhou Xintiandi, 6038 Longgang Avenue,Shenzhen,P.R.China
Telephone:	(86-755)23288964
Fax:	(86-755)23288964

3 List of test equipment

Radiation emission							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	MTI-E043	Rohde&schwarz	ESPI7	101166	2022/06/04	2023/06/03
2	Broadband antenna	MTI-E044	schwarabeck	VULB9163	9163-1338	2022/06/04	2023/06/03
3	Horn antenna	MTI-E045	schwarabeck	BBHA9120D	9120D-2278	2022/06/04	2023/06/03
4	amplifier	MTI-E047	Hewlett-Packard	8447D	3113A06150	2022/06/04	2023/06/03
5	1GHz-26.5GHz Amplifier	MTI-E048	Agilent	8449B	3008A02400	2022/06/04	2023/06/03

Conduction emission							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Artificial power network	MTI-E023	Schwarzbeck	NSLK8127	NSLK8127#841	2022/06/04	2023/06/03
2	EMI Test Receiver	MTI-E021	Rohde&schwarz	ESCS30	100210	2022/06/04	2023/06/03
3	8-wire Impedance Stabilization Network	MTI-E026	Schwarzbeck	NTFM 8158	NTFM 8158 #199	2022/06/04	2023/06/03
4	Artificial power network	MTI-E025	Schwarzbeck	NSLK8127	8127183	2022/06/04	2023/06/03

Conduction immunity							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Conduction Immunity Signal Generator	MTI-E015	Schloder	CDG6000	126A1343/2015	2022/06/04	2023/06/03
2	Coupled decoupling network	MTI-E016	Schloder	M2/M3-16A	A2210332/2015	2022/06/04	2023/06/03

Voltage dips, short interruptions and voltage variations immunity							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Drop generator	MTI-E025	Prima/China	DRP61011AG	PR15056303	2022/06/04	2023/06/03

Power frequency magnetic field immunity							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	power frequency magnetic field generator	MTI-E011	china HTEC	HPFMF 100	153703	2022/06/04	2023/06/03

Electrostatic discharge immunity							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	ESD Simulator	MTI-E008	Schloder	SESD 30000	509325	2022/06/04	2023/06/03

Surge immunity							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Surge Generator	MTI-E010	china HTEC	HCWG 51	153702	2022/06/04	2023/06/03
Harmonic & flicker emissions							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	AC Rating Input	MTI-E023	shenzhen tongyuan	TY-8205	20150916809	2022/06/04	2023/06/03
2	Harmonic scintillation Analyzer	MTI-E013	Laplace	AC2000A	311216	2022/06/04	2023/06/03
Electrical Fast Transient/Burst immunity							
Item	Equipment name	Equipment No.	Manufacturer	Model	Serial No.	Calibration date	Due date
1	Electrical Fast Transient Generator	MTI-E009	HTEC	HEFT 51	153701	2022/06/04	2023/06/03

RS equipment						
Item	Equipment	Manufacturer	Model	Serial No.	Calibration Due	Due date
1	Power Amplifier	micotop	MPA-80-1000-250	MPA1903081	2022/06/04	2023/06/03
2	Power Amplifier	micotop	MPA-1000-6000-75	MPA1903082	2022/06/04	2023/06/03
3	MXG RF Signal Generator	Agilent	N5181A	MY47420567	2022/06/04	2023/06/03
4	Stacked Log. Per. Broadband Antenna	Schwarzbeck	STLP 9129	9129 113	2022/06/04	2023/06/03
5	Three-phase Frequency Conversion Power Supply	shenzhen tongyuan	TY-8330	2017101302651	2022/06/04	2023/06/03
6	DC Rating Input	shenzhen tongyuan	TY-500V 100A	201710190325689	2022/06/04	2023/06/03
7	Gauss Meter	TRIAXIAL ELF	TES-1393	190200579	2022/06/04	2023/06/03

Note: the calibration interval of the above test instruments is 12 months and the calibrations are traceable to international system unit (SI).

4 EMC emission test

4.1 Conducted emission

4.1.1 Limits

Frequency (MHz)	Class A (dBμV)		Class B (dBμV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 -0.5	79	66	66 - 56 *	56 - 46 *
0.5 -5	73	60	56	46
5 -30	73	60	60	50

4.1.2 Test Procedures

The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through an Artificial mains networks (AMN). All other support equipment powered from additional AMN. The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.

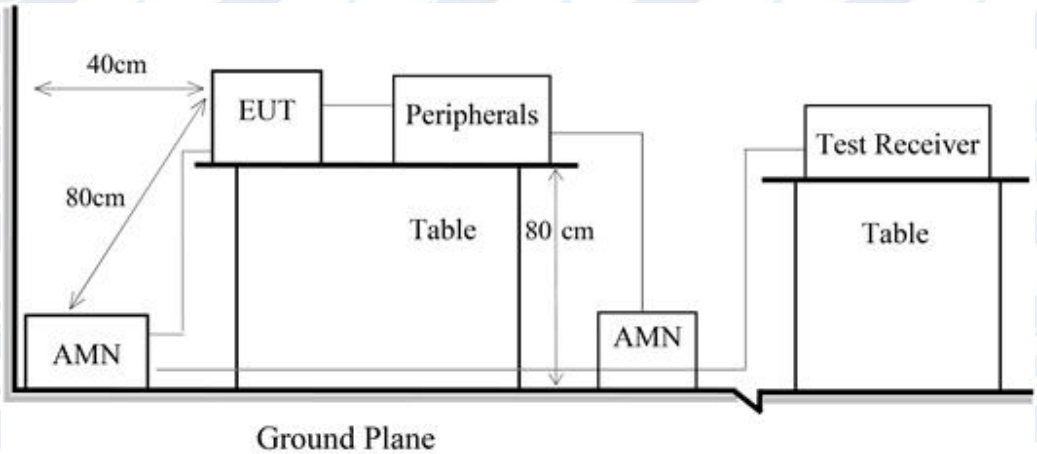
I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.

AMN is at least 80 cm from nearest part of EUT chassis.

Setup of the receiver

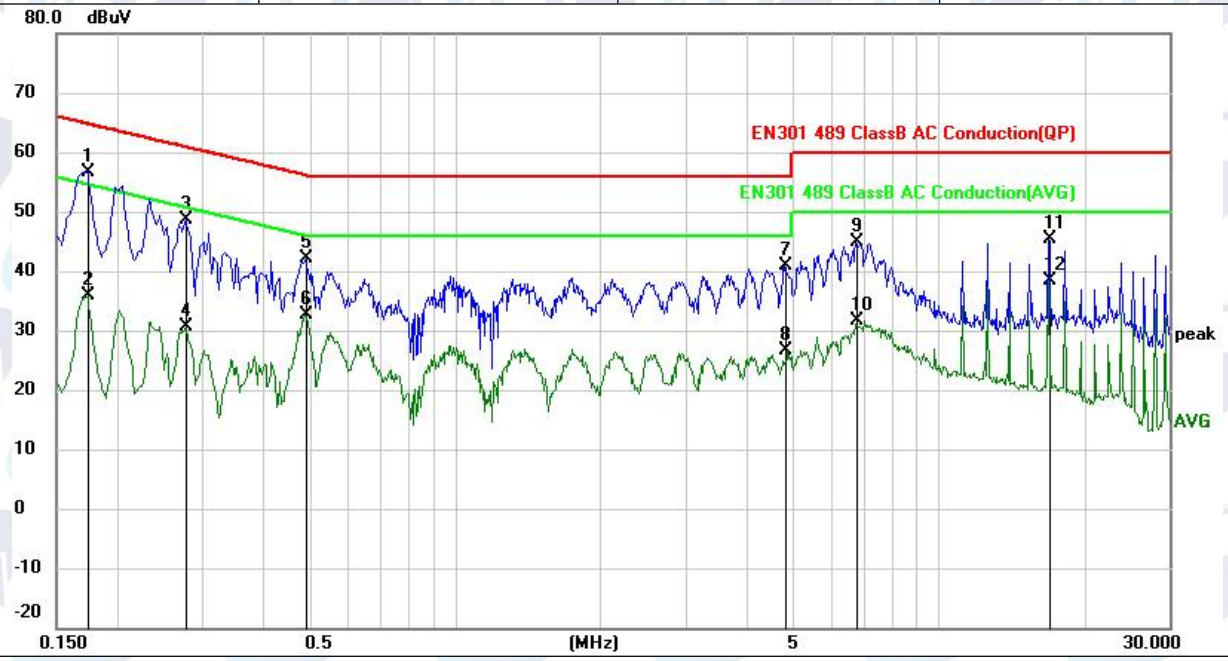
Frequency	Detector	Setting
0.15MHz – 30MHz	QP	IF bandwidth: 9kHz

4.1.3 Test setup



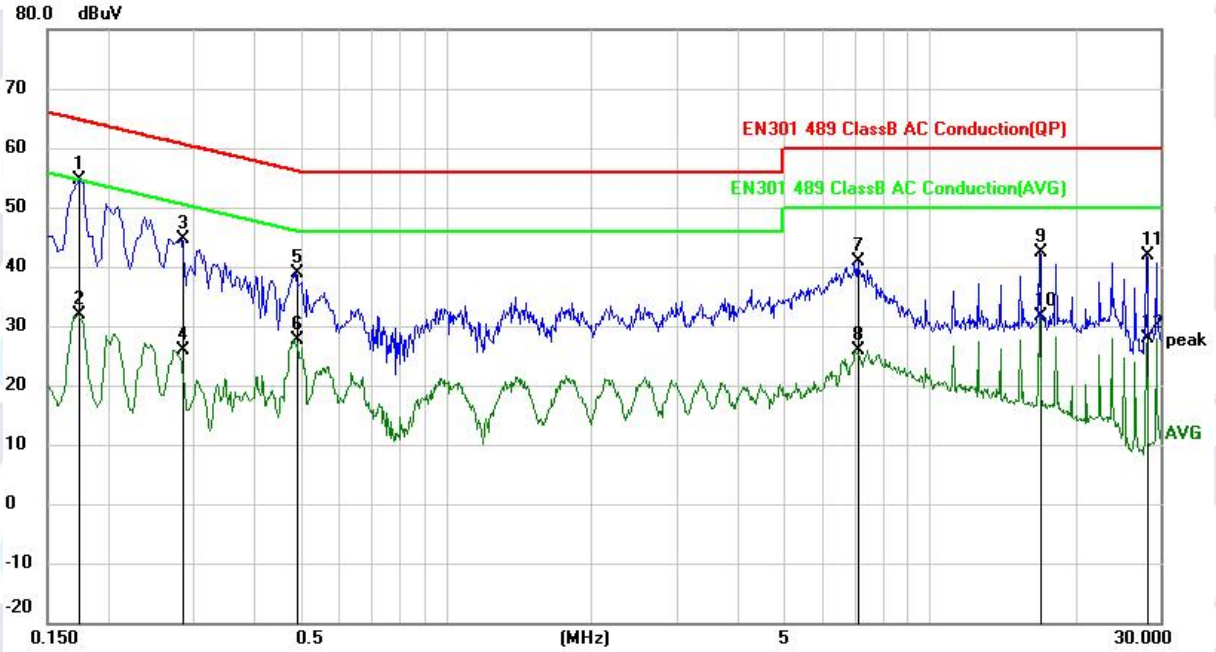
4.1.4 Test Result

EUT	Motherboard	Model Name：	AIoT3568
Pressure:	101kPa	Phase:	L
Test voltage:	DC5V	Test mode:	Mode 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1740	46.94	9.74	56.68	64.77	-8.09	QP
2		0.1740	26.10	9.74	35.84	57.40	-21.56	AVG
3		0.2779	38.99	9.76	48.75	60.88	-12.13	QP
4		0.2779	20.79	9.76	30.55	52.34	-21.79	AVG
5		0.4900	32.10	9.92	42.02	56.17	-14.15	QP
6		0.4900	22.78	9.92	32.70	46.22	-13.52	AVG
7		4.7980	30.74	10.17	40.91	56.00	-15.09	QP
8		4.7980	16.53	10.17	26.70	46.00	-19.30	AVG
9		6.7540	34.70	10.28	44.98	60.00	-15.02	QP
10		6.7540	21.45	10.28	31.73	50.00	-18.27	AVG
11		16.8620	35.03	10.42	45.45	60.00	-14.55	QP
12		16.8620	27.93	10.42	38.35	50.00	-11.65	AVG

EUT：	Motherboard	Model Name：	AIoT3568
Pressure:	101kPa	Phase:	N
Test voltage:	DC5V	Test mode:	Mode 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1740	44.84	9.74	54.58	64.77	-10.19	QP
2		0.1740	22.05	9.74	31.79	57.40	-25.61	AVG
3		0.2860	34.79	9.77	44.56	60.64	-16.08	QP
4		0.2860	16.17	9.77	25.94	52.03	-26.09	AVG
5		0.4900	28.88	9.92	38.80	56.17	-17.37	QP
6		0.4900	17.77	9.92	27.69	46.22	-18.53	AVG
7		7.1180	30.58	10.29	40.87	60.00	-19.13	QP
8		7.1180	15.62	10.29	25.91	50.00	-24.09	AVG
9		16.8500	31.87	10.42	42.29	60.00	-17.71	QP
10		16.8500	21.26	10.42	31.68	50.00	-18.32	AVG
11		28.0900	31.24	10.67	41.91	60.00	-18.09	QP
12		28.0900	17.29	10.67	27.96	50.00	-22.04	AVG

4.2 Radiated emission

4.2.1 Limits

Frequency (MHz)	Class B Limit (dBμV/m)		Class A Limit (dBμV/m)	
	Quasi-peak/Peak	Average	Quasi-peak/Peak	Average
30 ~ 230	40 (at 3m)	/	50 (at 3m)	/
230 ~ 1000	47 (at 3m)	/	57 (at 3m)	/
1000 ~ 3000	70 (at 3m)	50 (at 3m)	76 (at 3m)	56 (at 3m)
3000 ~ 6000	74 (at 3m)	54 (at 3m)	80 (at 3m)	60 (at 3m)

4.2.2 Test Procedures

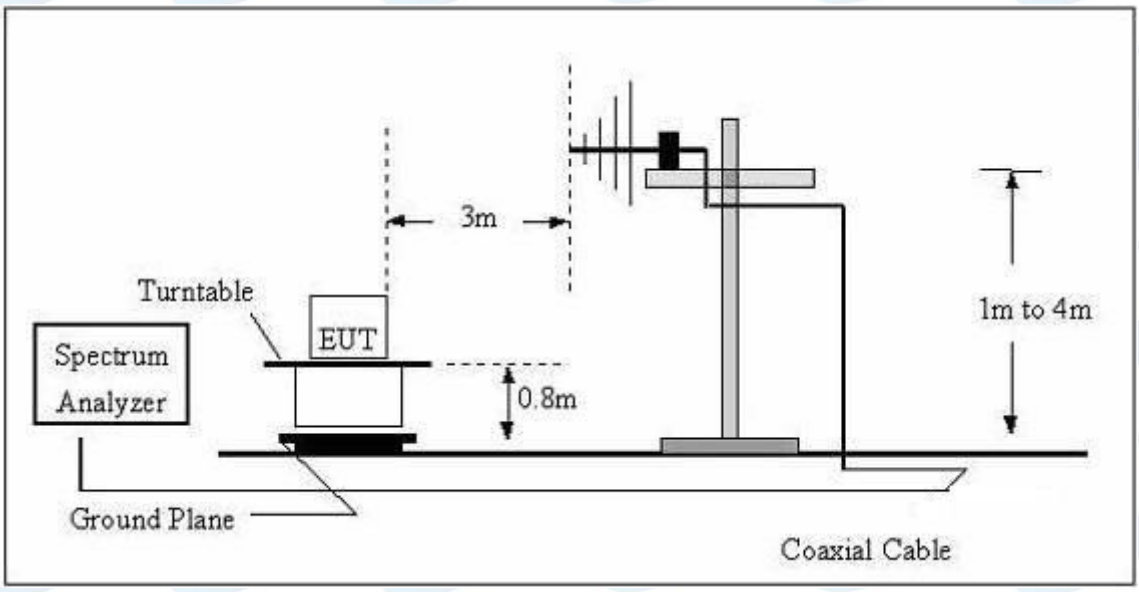
a. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
c. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
d. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Setup of receiver:

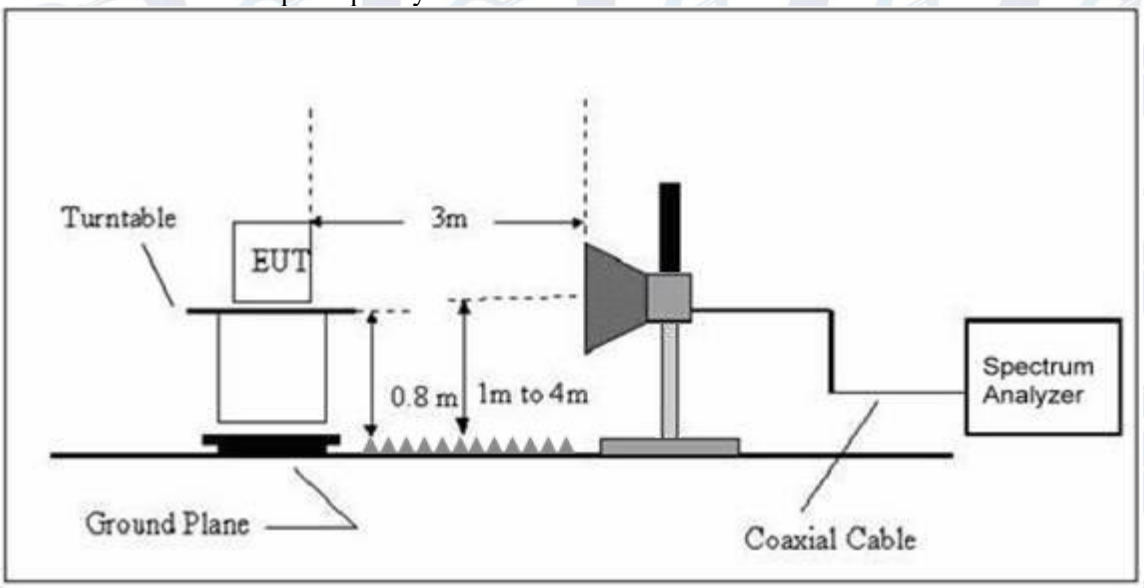
Frequency	Detector	Setting
30MHz – 1GHz	QP	IF bandwidth: 120kHz
Above 1GHz	Peak	RBW: 1MHz, VBW: 3MHz
	AV	RBW: 1MHz, VBW: 10Hz

4.2.3 Test Setup

Radiated Emission Test Set-Up Frequency Below 1 GHz

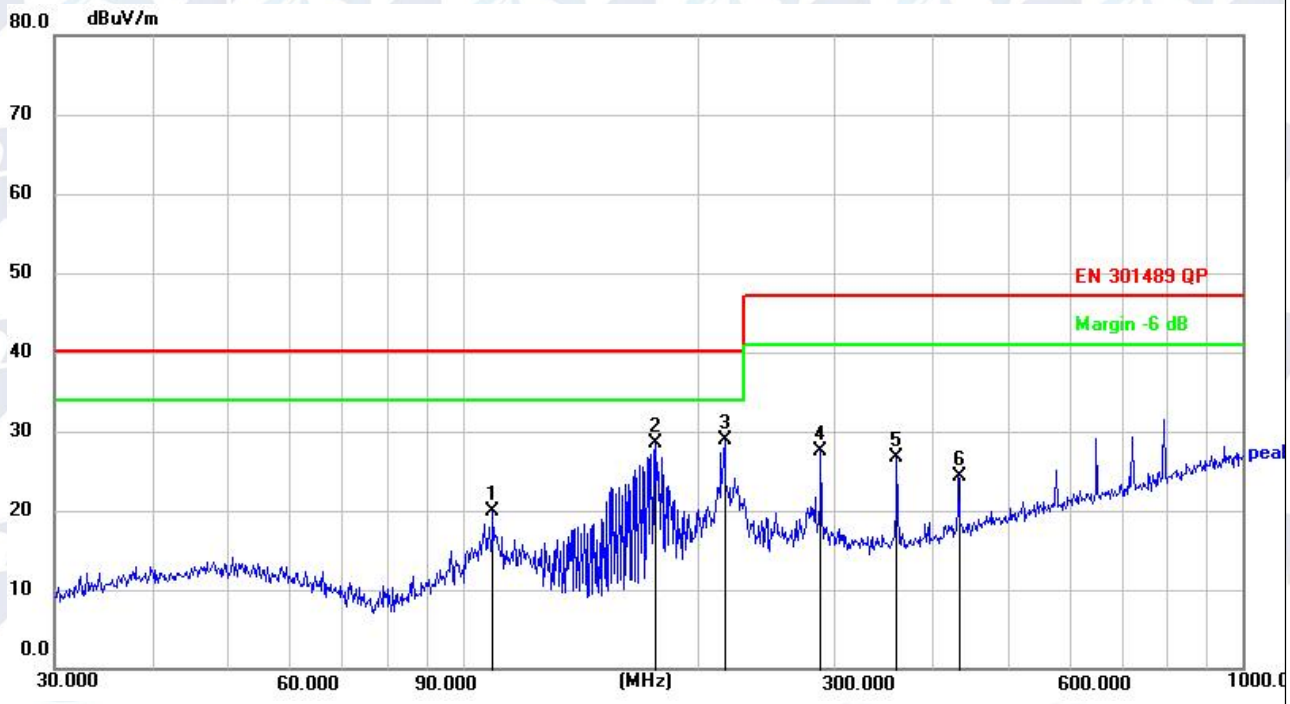


Radiated Emission Test Set-Up Frequency Above 1GHz



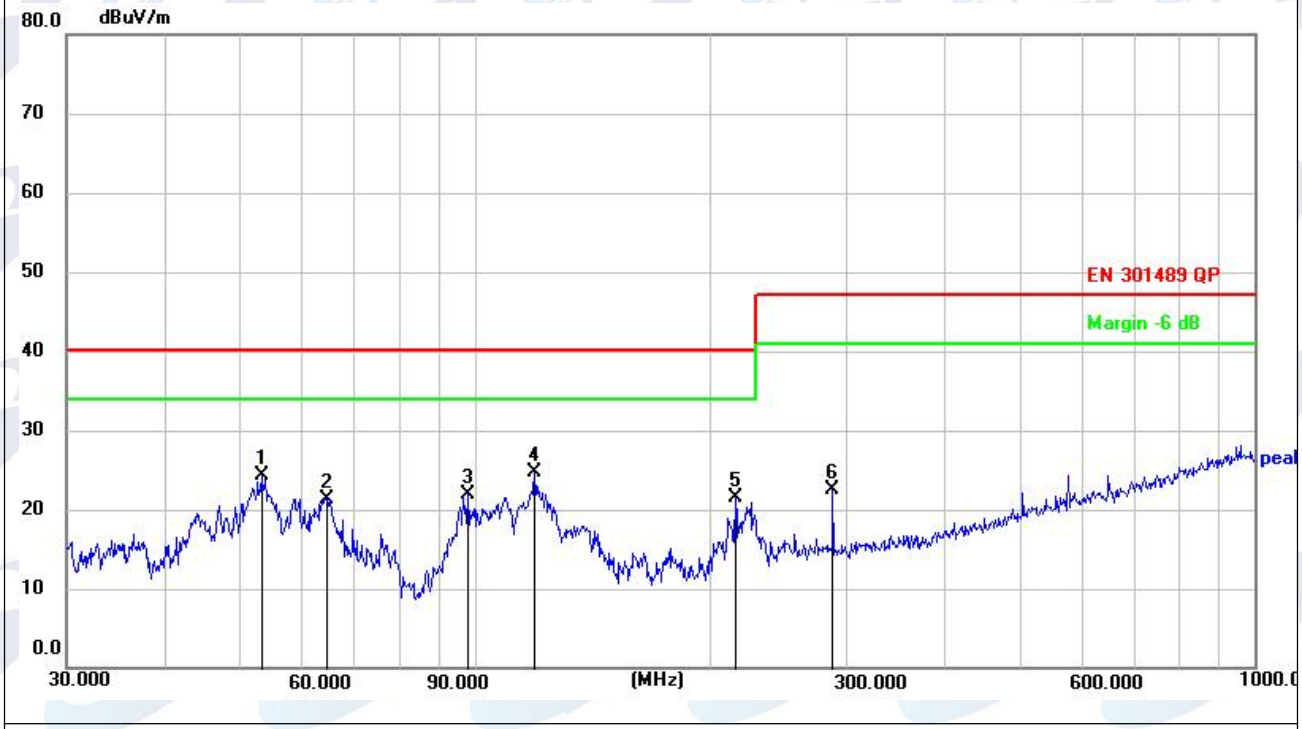
4.2.4 Test Result

EUT:	Motherboard	Model Name:	AIoT3568
Pressure:	101kPa	Polarization:	Horizontal
Test voltage:	DC 5V	Test mode:	Mode 1



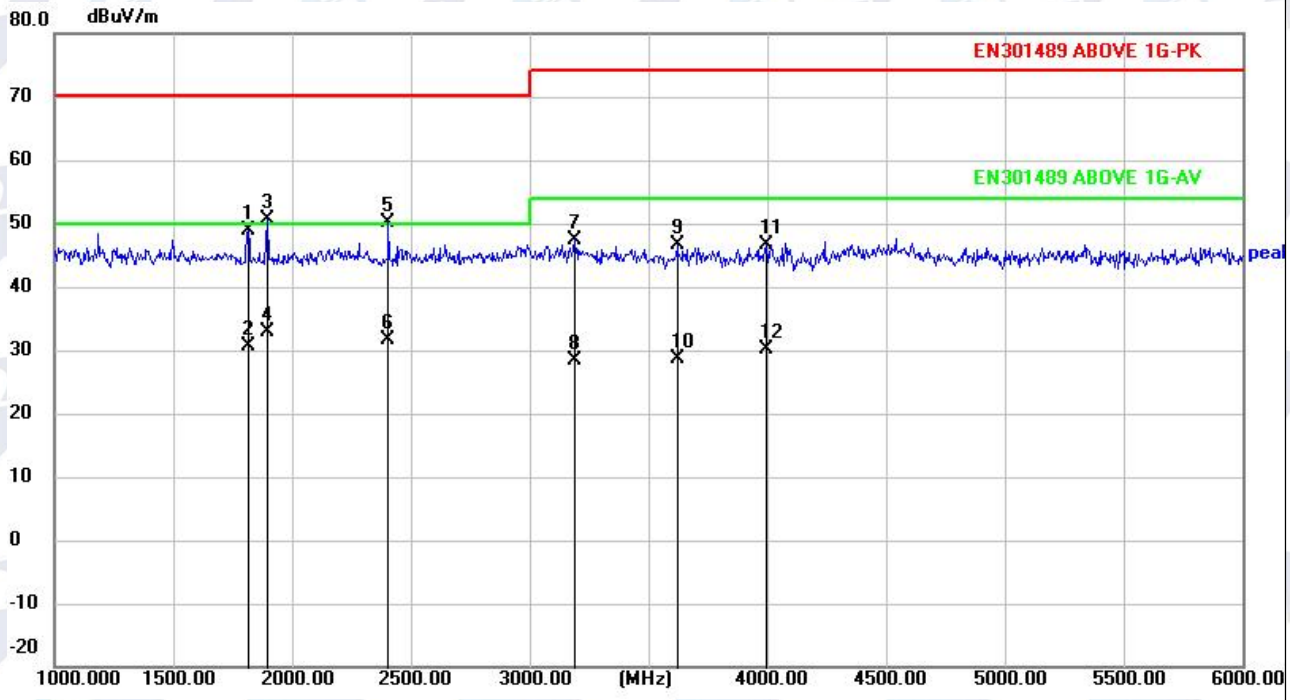
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	109.4116	34.66	-14.74	19.92	40.00	-20.08	QP
2	176.8878	44.15	-15.73	28.42	40.00	-11.58	QP
3 *	216.7828	42.02	-13.20	28.82	40.00	-11.18	QP
4	287.9904	38.25	-10.84	27.41	47.00	-19.59	QP
5	360.4476	36.28	-9.54	26.74	47.00	-20.26	QP
6	432.5457	32.75	-8.35	24.40	47.00	-22.60	QP

EUT:	Motherboard	Model Name:	AIoT3568
Pressure:	101kPa	Polarization:	Vertical
Test voltage:	DC 5V	Test mode:	Mode 1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	53.3179	38.29	-13.89	24.40	40.00	-15.60	QP
2	64.6594	37.42	-16.05	21.37	40.00	-18.63	QP
3	98.1418	36.87	-15.04	21.83	40.00	-18.17	QP
4 *	119.4360	40.53	-15.87	24.66	40.00	-15.34	QP
5	216.0239	34.82	-13.23	21.59	40.00	-18.41	QP
6	287.9904	33.34	-10.84	22.50	47.00	-24.50	QP

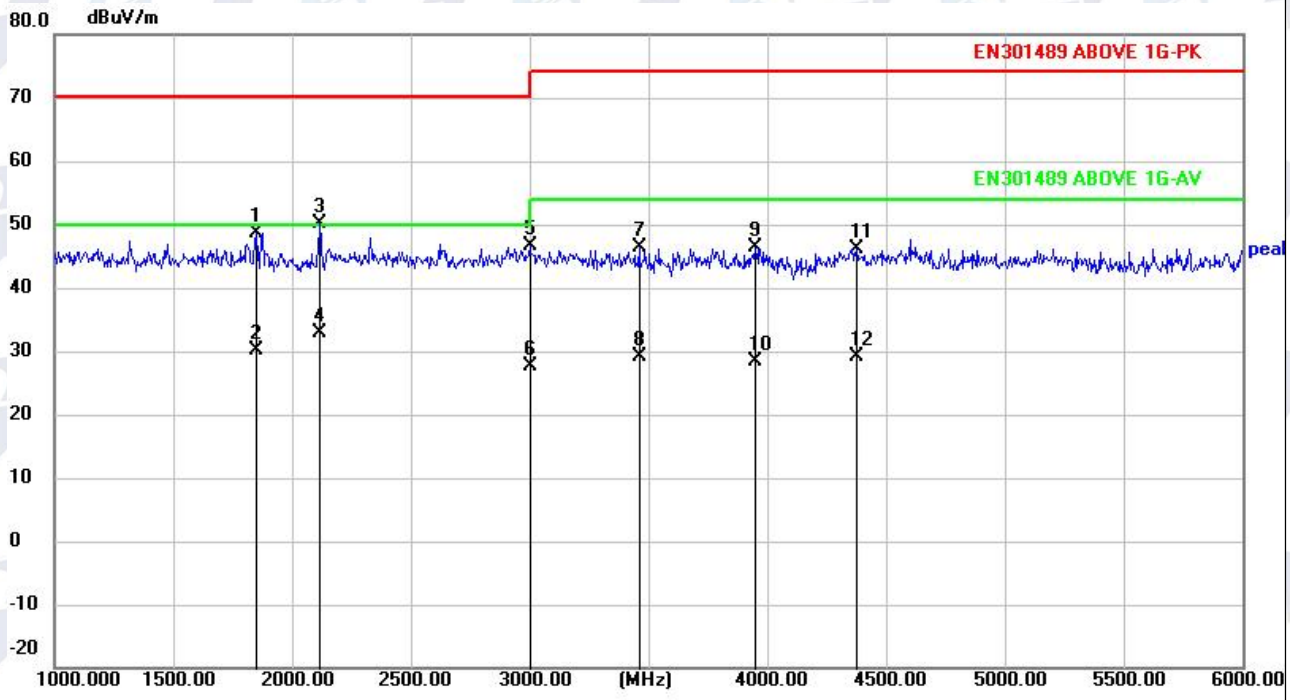
EUT:	Motherboard	Model Name:	AIoT3568
Pressure:	101kPa	Polarization:	Horizontal
Test voltage:	DC 5V	Test mode:	Mode 1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1815.000	45.99	2.93	48.92	70.00	-21.08	peak
2	1815.000	27.77	2.93	30.70	50.00	-19.30	AVG
3	1895.000	47.49	3.03	50.52	70.00	-19.48	peak
4 *	1895.000	29.87	3.03	32.90	50.00	-17.10	AVG
5	2405.000	46.65	3.55	50.20	70.00	-19.80	peak
6	2405.000	27.96	3.55	31.51	50.00	-18.49	AVG
7	3190.000	43.37	4.03	47.40	74.00	-26.60	peak
8	3190.000	24.37	4.03	28.40	54.00	-25.60	AVG
9	3620.000	42.30	4.29	46.59	74.00	-27.41	peak
10	3620.000	24.41	4.29	28.70	54.00	-25.30	AVG
11	3995.000	42.04	4.63	46.67	74.00	-27.33	peak
12	3995.000	25.47	4.63	30.10	54.00	-23.90	AVG

Note 1: The test modes were carried out for all operation modes. The worst test mode for test data was showed in the report.

EUT:	Motherboard	Model Name:	AIoT3568
Pressure:	101kPa	Polarization:	Vertical
Test voltage:	DC 5V	Test mode:	Mode 1



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1850.000	45.70	2.98	48.68	70.00	-21.32	peak
2	1850.000	27.12	2.98	30.10	50.00	-19.90	AVG
3	2115.000	46.81	3.24	50.05	70.00	-19.95	peak
4 *	2115.000	29.66	3.24	32.90	50.00	-17.10	AVG
5	3000.000	42.50	4.14	46.64	70.00	-23.36	peak
6	3000.000	23.46	4.14	27.60	50.00	-22.40	AVG
7	3460.000	42.06	4.40	46.46	74.00	-27.54	peak
8	3460.000	24.70	4.40	29.10	54.00	-24.90	AVG
9	3950.000	41.71	4.55	46.26	74.00	-27.74	peak
10	3950.000	23.88	4.55	28.43	54.00	-25.57	AVG
11	4375.000	41.24	4.95	46.19	74.00	-27.81	peak
12	4375.000	24.15	4.95	29.10	54.00	-24.90	AVG

Note 1: The test modes were carried out for all operation modes. The worst test mode for test data was showed in the report.

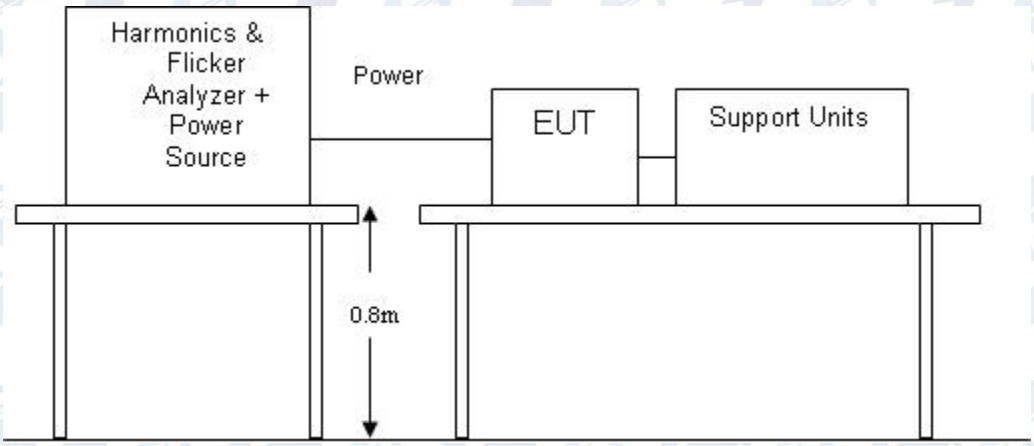
4.3 Harmonic current emission / Voltage fluctuations & flicker

4.3.1 Test Procedures

The EUT was installed and placed on a non-conductive table and operated to produce the maximum harmonic components under normal operating conditions for each successive harmonic component in turn.

The correspondent test program of test instrument to measure the current harmonics / voltage fluctuations & flicker emanated from EUT. The measure time shall be not less than the time necessary for the EUT to be exercised.

4.3.2 Test Setup



4.3.3 Test Result

Harmonic current emission:

N/A, the rated power of EUT is below 75W.

Voltage fluctuations & flicker:

EUT:	Motherboard	Model Name:	AIoT3568,DS3288-A,DS3288-B,DS133,DS3566,DS960X,DS3128,AIoT3568-X, AIoT3568-V, AIoT3399-X, AI3399-C, AIoT3588
Pressure:	101kPa	Test mode:	Mode 1

	Pst	Plt	dc (%)	dmax (%)	d(t) > 3.3% (ms)
Limit	1.000	0.650	3.300	4.000	500
Reading	0.26	0.01	1.82	1.92	0

5 Immunity test

5.1 Electrostatic discharge immunity (ESD)

5.1.1 Test Method

The test method shall be in accordance with EN 61000-4-2.

For radio equipment and ancillary equipment the following requirements and evaluation of test results shall apply.

The test severity level for contact discharge shall be 4 kV and for air discharge 8kV. All other details, including intermediate test levels, are contained within EN 61000-4-2.

Electrostatic discharges shall be applied to all exposed surfaces of the EUT except where the user documentation specifically indicates a requirement for appropriate protective measures (see EN 61000-4-2).

5.1.2 Performance criteria

According to EN 301489-17 standard, the general performance criteria as following:

Criteria	During the test	After the test
A	Shall operate as intended. (see note 1). Shall be no loss of function. Shall be no unintentional transmissions	Shall operate as intended. Shall be no degradation of performance (see note 3). Shall be no loss of function. Shall be no loss of stored data or user programmable functions.
B	May show loss of function (one or more). May show degradation of performance (see note 2). Shall be no unintentional transmissions.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). Shall be no loss of stored data or user programmable functions.
C	May be loss of function (one or more)	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3).

NOTE 1: Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 2: Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

NOTE 3: No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the

specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed. If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

PERFORMANCE FOR TT

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5000 ms duration, for which performance criteria C shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR TR

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5000 ms duration for which performance criteria C shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

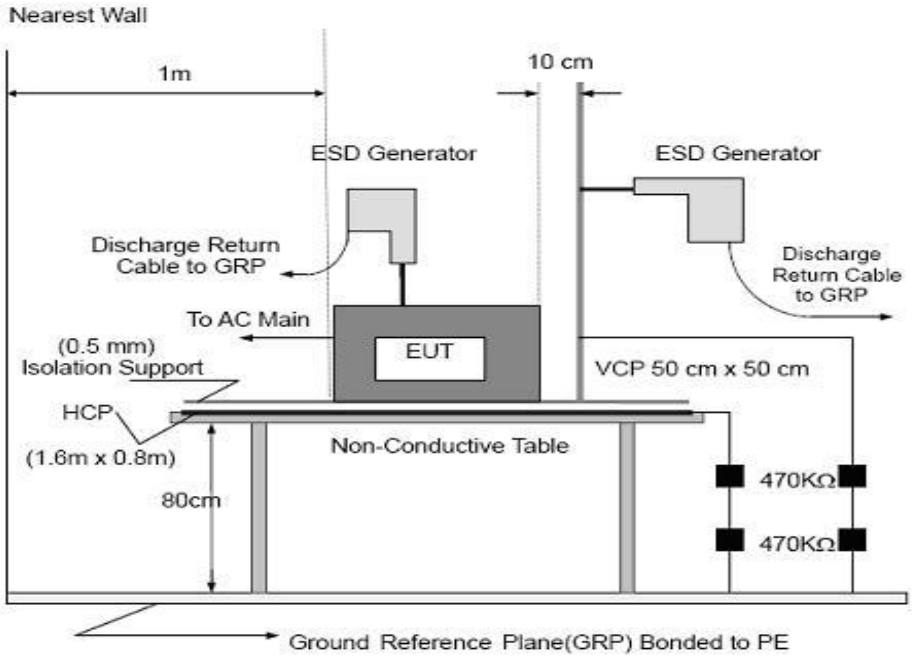
PERFORMANCE FOR CT

The performance criteria A shall apply. Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an Acknowledgement (ACK) or Not Acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

PERFORMANCE FOR CR

The performance criteria A shall apply. Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

5.1.3 Test Setup


Nearest Wall
1m
10 cm
ESD Generator
ESD Generator
Discharge Return Cable to GRP
Discharge Return Cable to GRP
To AC Main
(0.5 mm) Isolation Support
EUT
VCP 50 cm x 50 cm
HCP
(1.6m x 0.8m)
Non-Conductive Table
80cm
470KΩ
470KΩ
Ground Reference Plane(GRP) Bonded to PE

5.1.4 Test Result

EUT:	Motherboard	Model Name:	AIoT3568
Pressure:	101kPa	Test mode:	Mode 1

Indirect discharge

Test Point	Contact discharge level (kV)	Number and polarity	Criterion met	Criterion Required
1. VCP-Front side	☐..2 ☒..4	10 (+)	A	B
	☐..6 ☐..8	10 (-)	A	
2.VCP-Rear side	☐..2 ☒..4	10 (+)	A	
	☐..6 ☐..8	10(-)	A	
3.VCP-Left side	☐..2 ☒..4	10 (+)	A	
	☐..6 ☐..8	10(-)	A	
4. VCP-Right side	☐..2 ☒..4	10(+)	A	
	☐..6 ☐..8	10 (-)	A	
5. HCP	☐..2 ☒..4	10(+)	A	
	☐..6 ☐..8	10(-)	A	

Result: Compliance.

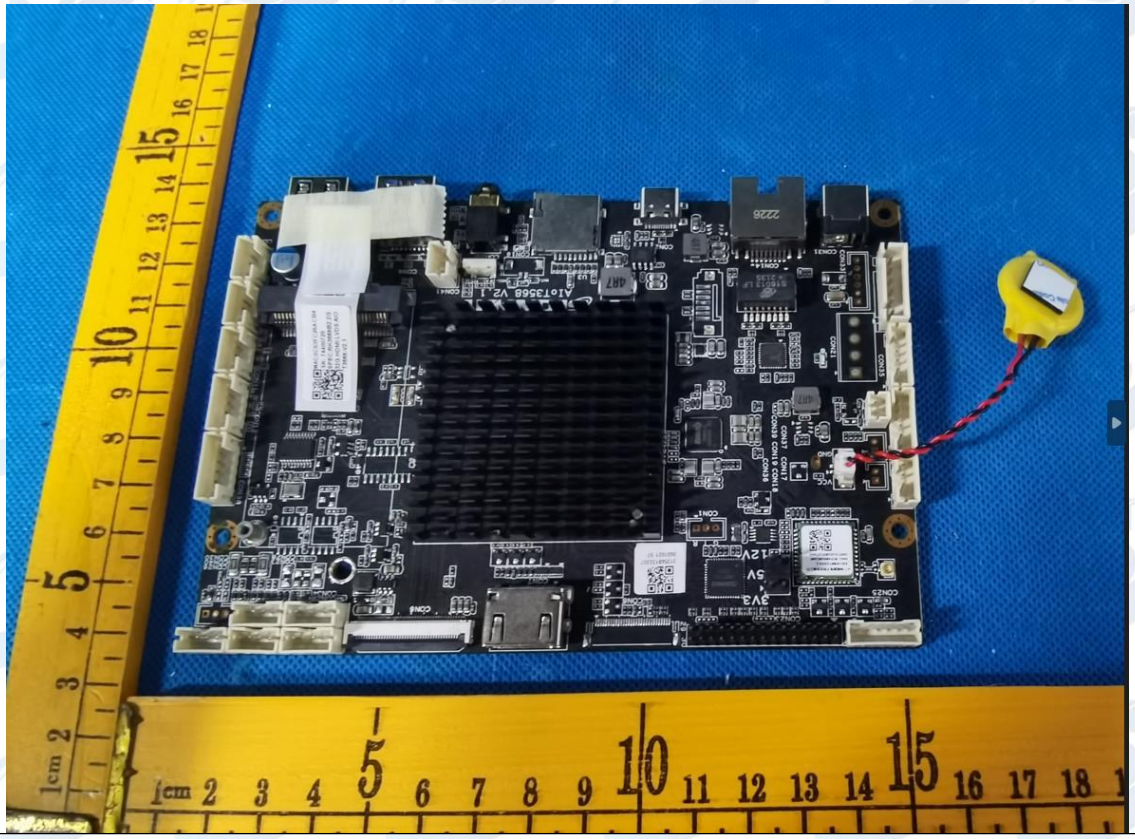
Direct discharge

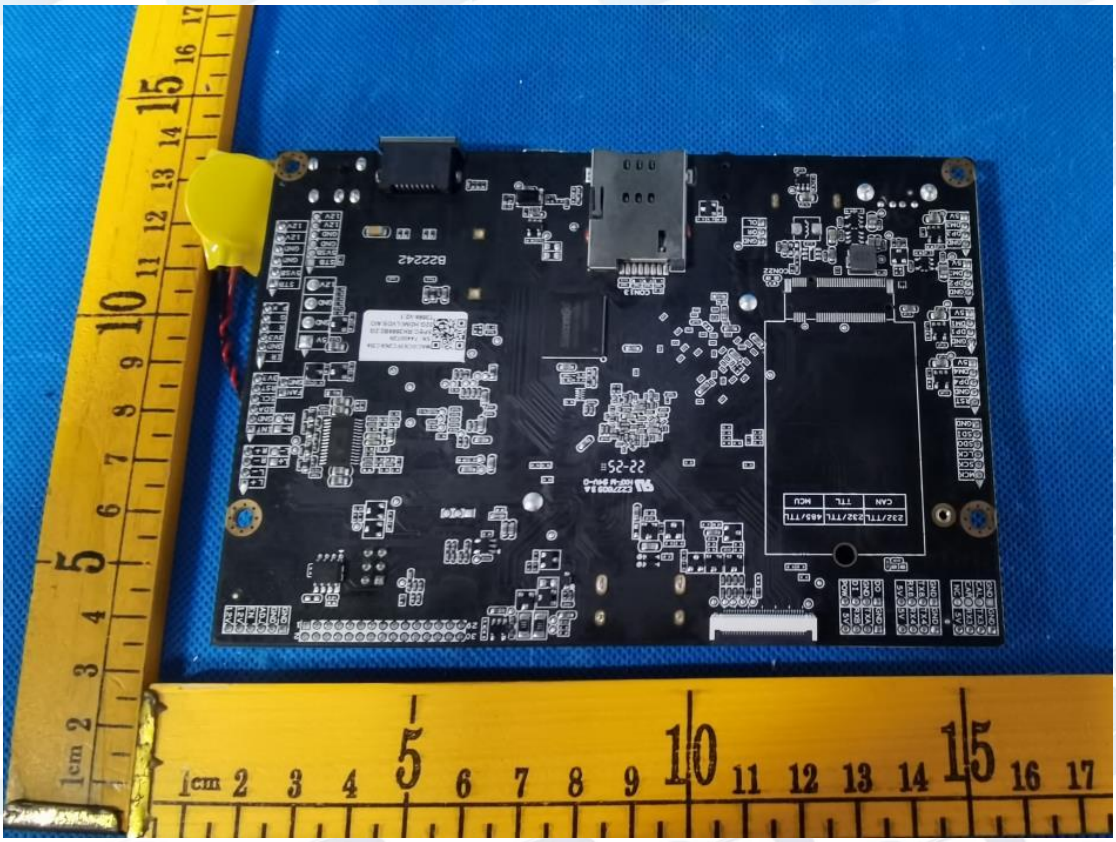
Test Point	Contact discharge level (kV)	Air discharge level (kV)	Number and polarity	Criterion met	Obser vation	Criterion Required
1. Each nonconductive location touchable by hand	☐..2 ☐..4	☒..2 ☒..4	10 (+)	A	TT,TR	B
	☐..6 ☐..8	☐..6 ☒..8	10 (-)	A		
1. Each conductive location touchable by hand	☒..2 ☒..4	☐..2 ☐..4	10 (+)	A		
	☐..6 ☐..8	☐..6 ☐..8	10 (-)	A		

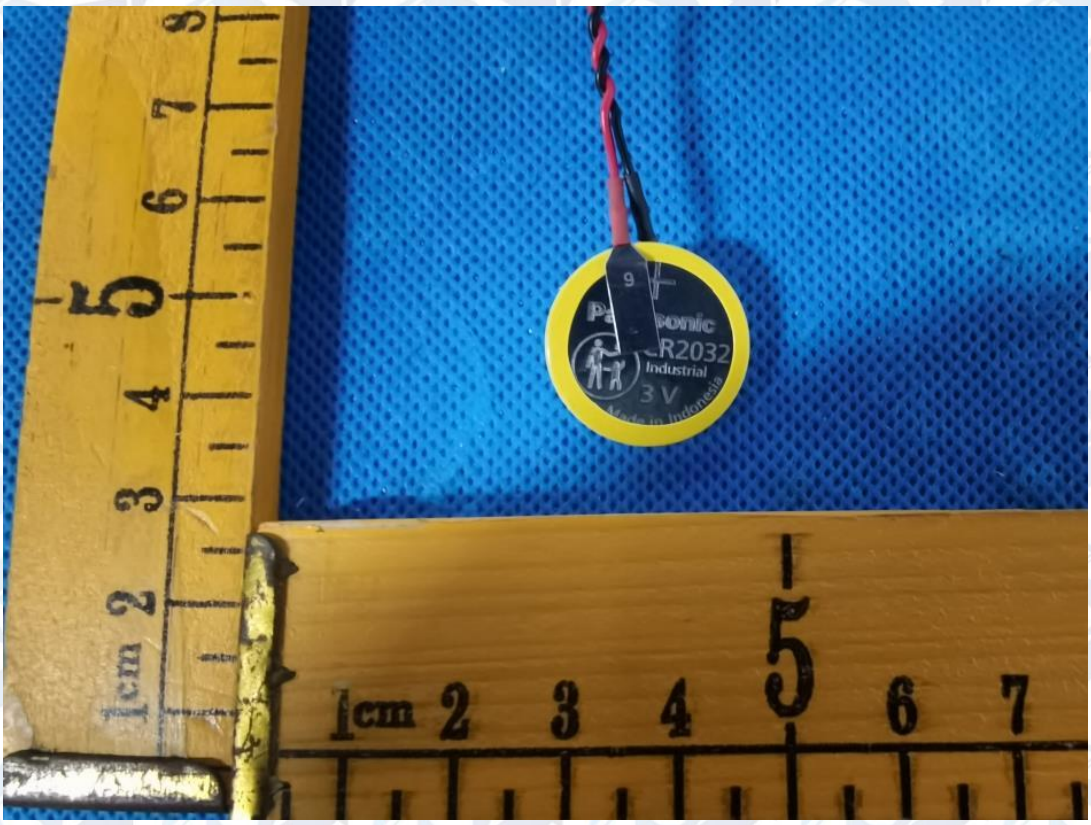
Result: compliance.

Note1: Please see the photographs below about the details of test points.

Test location







Note: Air is air discharge and Con is contact discharge.

5.2 RF electromagnetic field immunity (RS)

5.2.1 Test Method

The test method shall be in accordance with EN 61000-4-3.

The following requirements and evaluation of test results shall apply:

• the test level shall be 3V/m (measured unmodulated). The test signal shall be amplitude modulated to a depth of 80% by a sinusoidal audio signal of 1000Hz. If the wanted signal is modulated at 1000Hz, then an audio signal of 400Hz shall be used;

• the test shall be performed over the frequency range 80 MHz to 6 000 MHz with the exception of the exclusion band for transmitters, receivers and duplex transceivers, as appropriate;

• for receivers and transmitters the stepped frequency increments shall be 1 % frequency increment of the momentary used frequency,.

• the dwell time of the test phenomena at each frequency shall not be less than the time necessary for the EUT to be exercised and to be able to respond.

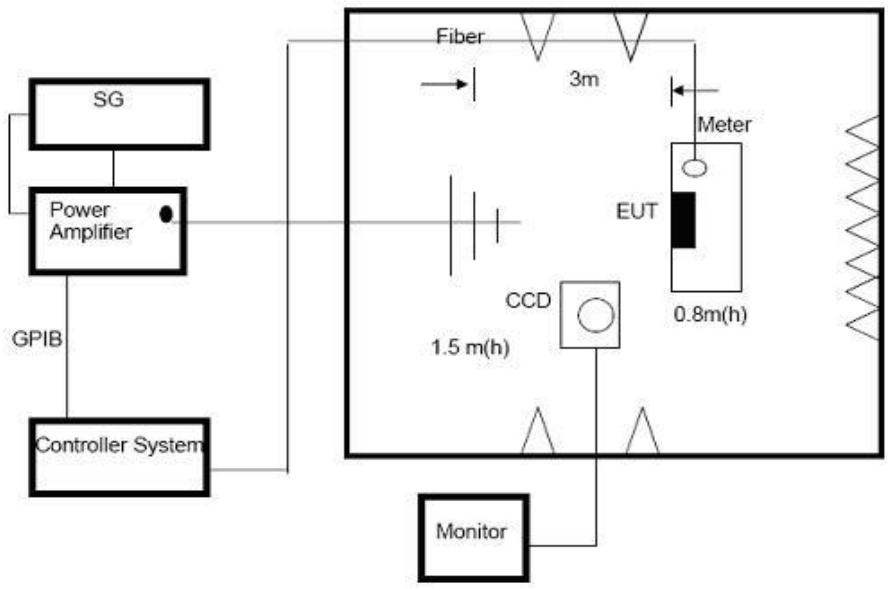
5.2.2 Performance criteria

For transmitters the performance criteria for continuous phenomena for transmitters shall apply.

For receivers the performance criteria for continuous phenomena for receivers shall apply.

For ancillary equipment the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter in which case the corresponding performance criteria above shall apply.

5.2.3 Test setup



5.2.4 Test Result

EUT:	Motherboard	Model Name:	AIoT3568,DS3288-A,DS3288-B,DS133,DS3566,DS960X,DS3128,AIoT3568-X, AIoT3568-V, AIoT3399-X, AI3399-C, AIoT3588
Pressure:	101kPa	Test mode:	Mode 1

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Obser vation	Criterion met	Criterion Required
80~6000	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	CT,CR	A	A
			Rear			
			Left			
			Right			

Result: compliance.

Note: “A” stand for: the uplink/downlink speech output level shall be at least 35 dB less than the previously recorded reference levels, when measured through an audio band pass filter of width 200 Hz, centred on 1 kHz (audio breakthrough check). The RXQUAL of the downlink is not exceeding the value of three, measured during each individual exposure in the test sequence. Or During and after the test, the apparatus continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level.

5.3 Fast transients immunity (EFT)

5.3.1 Test Procedures

The test method shall be in accordance with EN 61000-4-4.

The following requirements and evaluation of test results shall apply:

- the test level for signal ports, telecommunication ports, and control ports shall be 0.5kV open circuit voltage at a repetition rate of 5kHz as given in EN 61000-4-4;
- the test level for DC power input ports shall be 0.5kV open circuit voltage as given EN 61000-4-4;
- the test level for AC mains power input ports shall be 1kV open circuit voltage as given EN 61000-4-4.

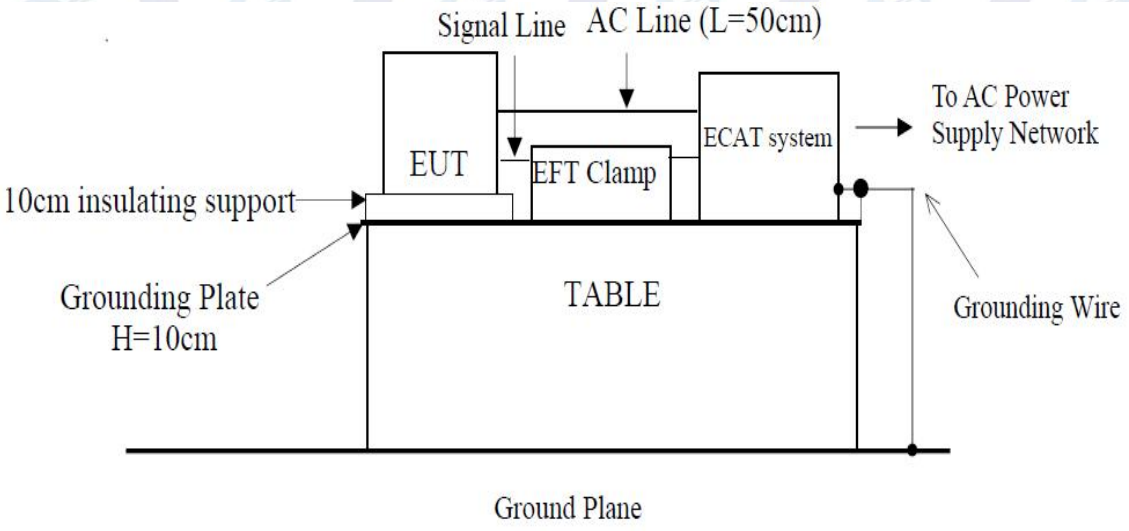
5.3.2 Performance criteria

For transmitters the performance criteria for transient phenomena for transmitter shall apply.

For receivers the performance criteria for transient phenomena for receivers shall apply.

For ancillary equipment the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter in which case the corresponding performance criteria shall apply.

5.3.3 Test Setup



5.3.4 Test Result

EUT:	Motherboard	Model Name:	AIoT3568
Pressure:	101kPa	Test mode:	Mode 1

Port Type	Injected Line	Test Voltage	Criterion met	Criterion Required
AC Mains	L	±1kV	A	B
	N	±1kV	A	B
	L+N	±1kV	A	B

Result: compliance.

5.4 Surges immunity

5.4.1 Test Method

The test method shall be in accordance with EN 61000-4-5.

Test method for telecommunication ports directly connected to outdoor cables:

The test level for telecommunications ports, intended to be directly connected to the telecommunications network via outdoor cables, shall be 1kV line to ground as given in EN 61000-4-5, however, in telecommunications centres 0.5kV line to ground shall be used. In this case the total output impedance of the surge generator shall be in accordance with the basic standard EN 61000-4-5. The test generator shall provide the 1.2/50μs pulse as defined in EN 61000-4-5.

Test method for telecommunication ports connected to indoor cables:

The test level for telecommunication ports, intended to be connected to indoor cables (longer than 10m) shall be 0.5kV line to ground. In this case the total output impedance of the surge generator shall be in accordance with the basic standard EN 61000-4-5. The test generator shall provide the 1,2/50μs pulse as defined in EN 61000-4-5.

Test method for mains ports:

The test level for ac mains power input ports shall be 2kV line to ground, and 1kV line to line, with the output impedance of the surge generator as given in EN 61000-4-5. In telecom centres 1kV line to ground and 0,5kV line to line shall be used. The test generator shall provide the 1,2/50μs pulse as defined in EN 61000-4-5.

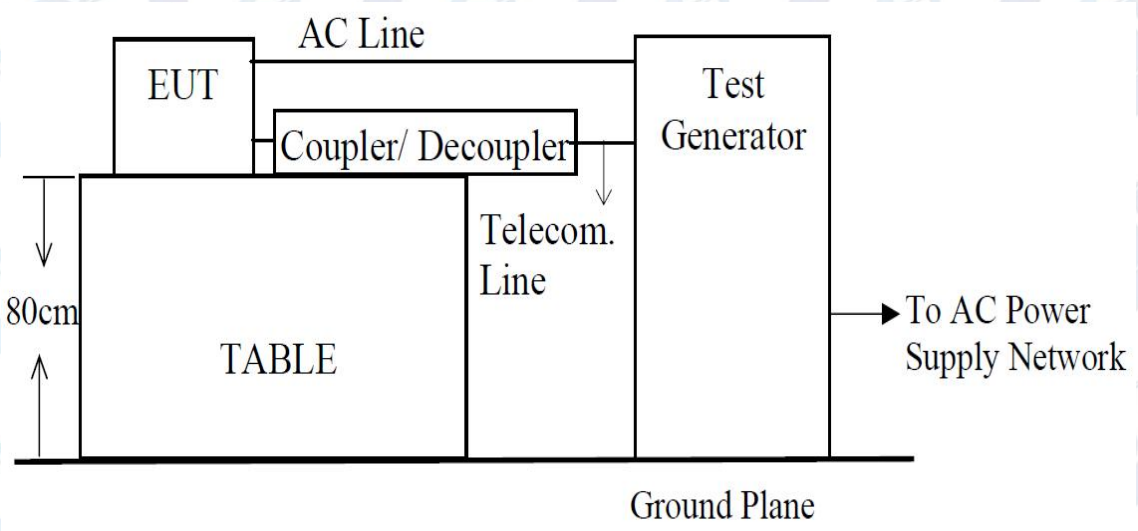
5.4.2 Performance criteria

For transmitters the performance criteria for transient phenomena for transmitters shall apply.

For receivers the performance criteria for transient phenomena for receivers shall apply.

For ancillary equipment the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter in which case the corresponding performance criteria above shall apply.

5.4.3 Test Setup



5.4.4 Test Result

EUT:	Motherboard	Model Name:	AIoT3568
Pressure:	101kPa	Test mode:	Mode 1

Port Type	Injected Line	Test Voltage	Criterion met	Criterion Required
AC Mains	L – N	±0.5kV, ±1kV	A	A

Result: Compliance.

5.5 Injected current immunity (CS)

5.5.1 Test Method

The test method shall be in accordance with EN 61000-4-6.

The following requirements and evaluation of test results shall apply:

- the test level shall be severity level 2 as given in EN 61000-4-6 corresponding to 3V rms unmodulated. The test signal shall then be amplitude modulated to a depth of 80% by a sinusoidal audio signal of 1000Hz. If the wanted signal is modulated at 1000Hz, then the test signal of 400Hz shall be used;
- the test shall be performed over the frequency range 150kHz to 80MHz with the exception of an exclusion band for transmitters, and for receivers and duplex transceivers;
- for receivers and transmitters the stepped frequency increments shall be 1% frequency increment of the momentary frequency in the frequency range 150kHz to 80MHz;
- the injection method to be used shall be selected according to the basic standard EN 61000-4-6;
- responses on receivers or receiver parts of transceivers occurring at discrete frequencies which are narrow band responses (spurious responses), are disregarded from the test;

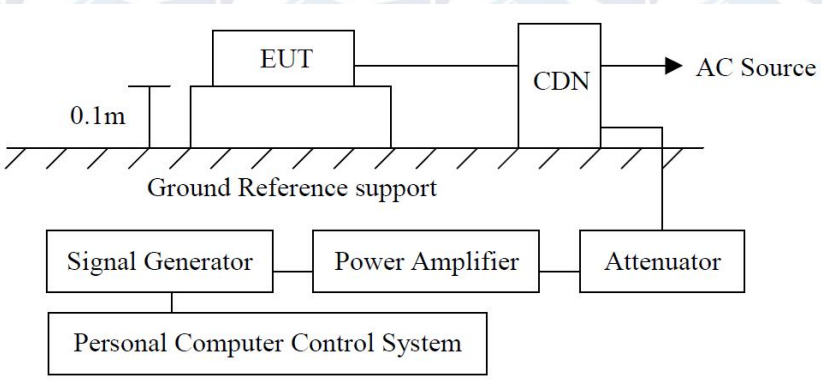
5.5.2 Performance criteria

For transmitters the performance criteria for continuous phenomena for transmitter shall apply.

For receivers the performance criteria for continuous phenomena for receivers shall apply.

For ancillary equipment the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with receivers or transmitters in which case the corresponding performance criteria above shall apply.

5.5.3 Test Setup



5.5.4 Test Result

EUT:	Motherboard	Model Name:	AIoT3568
Pressure:	101kPa	Test mode:	Mode 1

Port Type	Frequency (MHz)	Test Voltage	Criterion met	Criterion Required
AC Mains	0.15 to 80	3 V (rms) AM Modulated 1000Hz, 80%	A	A

Result: Compliance.

Note: EUT is used for this calibration, the output of the audio source was adjusted to achieve a reference Level equivalent to a SPL of –5 dB Pa at 1 kHz at the Mouth Reference Point (MRP), the reading of the audio level meter, which was connected to the output of the communication tester, was recorded as a reference level. During the test, the uplink speech output level was monitored, it was confirmed to be at least 35 dB less than the previously- recorded reference level.

5.6 Voltage interruptions voltage Dips

5.6.1 Test Method

The test method shall be in accordance with EN 61000-4-11.

The test levels shall be:

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

5.6.2 Performance criteria

For a voltage dip the following performance criteria apply:

• for transmitters the performance criteria for transient phenomena for transmitter shall apply;

• for receivers the performance criteria for transient phenomena for receiver shall apply;

• for ancillary equipment the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with a receiver or transmitter in which case the corresponding performance criteria above shall apply.

For a voltage interruption the following performance criteria apply:

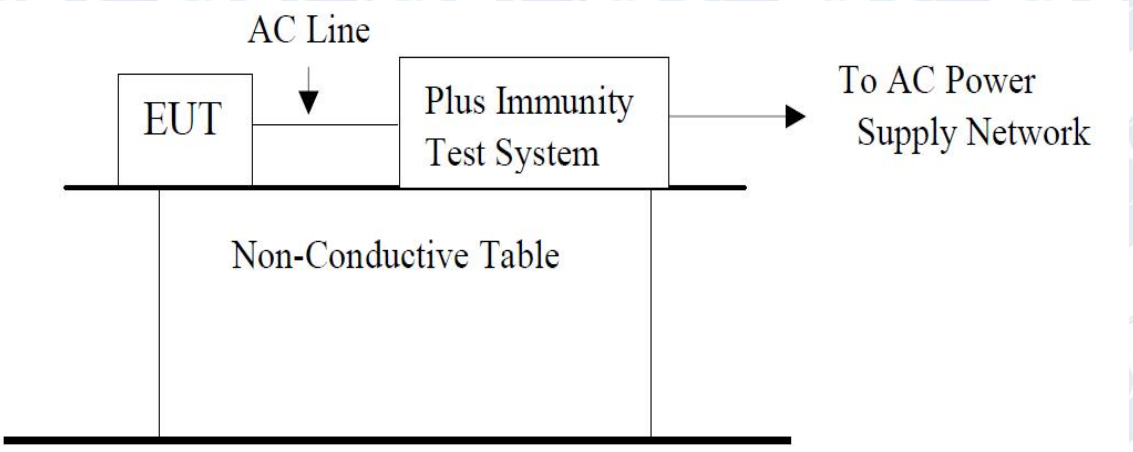
• in the case where the equipment is fitted with or connected to a battery back-up, the performance criteria for transient phenomena for transmitters or for receivers shall apply;

• in the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator;

• no unintentional responses shall occur at the end of the test; • in the event of loss of function(s) or in the event of loss of user stored data, this fact shall be recorded in the test report;

• for ancillary equipment the pass/failure criteria supplied by the manufacturer shall apply, unless the ancillary equipment is tested in connection with

5.6.3 Test Setup



5.6.4 Test Result

EUT:	Motherboard	Model Name:	AIoT3568
Pressure:	101kPa	Test mode:	Mode 1

Test Level in %U_T	Duration (Period)	Criterion Required	Criterion met
0%	0.5	C	A
0%	1	B	A
70%	25	C	A
0%	250	C	A

Result: Compliance.

----END OF REPORT----