

EMC Test Report

Report No.: AST2208303001A-1
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Address: 102, 105, Zone 20, Huayin Industrial Port, No.618, KeXing Road(West), Wenjiang District, Chengdu 611137 Sichuan, P.R. China
Product name: Vibrating Foam Roller Plus
Model/Type reference: A02-M-007
Trademark: /
Standards: EN 301489-1 V2.2.3, EN 301489-17 V3.2.4, EN IEC 61000-3-2:2019/A1:2021, EN 61000-3-3:2013/A2:2021
Date of testing: Aug.05, 2022 - Aug.10, 2022
Date of issue: Aug.12, 2022
Test Result: PASS *

Remark:

* In the configuration tested, the EUT complied with the standards specified above.

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full without prior written permission of the company.
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Report Revision History

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1 Summary of Test Result

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

2 General description

2.1 Feature of equipment under test (EUT)

Product name:	Vibrating Foam Roller Plus
Model name:	A02-M-007
Series model:	N/A
Difference in series models:	N/A
EUT Power Rating:	DC 5V for adapter with AC 100-240V 50/60Hz
Adapter specification	Model:HKA03619021-8L Input:100-240VAC 50/60Hz Output:5VDC 2.1A
Battery:	N/A
EUT Highest Frequency	Above 108MHz

2.2 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.

Test Mode	Description
For Conducted Test (AC ports)	
Mode 1	System Full working+ WIFI
Mode 2	System Full working+ WIFI
Mode 3	/
For Conducted Test (Wired network port)	
Mode 1	
For Radiated Test	
Mode 1	System Full working
Mode 2	System Full working
Mode 3	/
For EMS Test	
Mode 1	System Full working
Mode 2	System Full working
Mode 3	/

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.

2.3 Test conditions

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

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

2.4 Ancillary equipment list

Equipment	Model	S/N	Manufacturer
/	/	/	/
/	/	/	/

2.5 Measurement Uncertainty

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

Conducted emission of AC power port	$\pm 3.02\text{dB}$
Conducted emission of asymmetric mode	$\pm 3.52\text{dB}$
Radiated emission(30MHz~1GHz)	$\pm 4.30\text{ dB}$
Radiated emission (above 1GHz)	$\pm 4.35\text{ dB}$
Temperature	$\pm 1\text{ degree}$
Humidity	$\pm 5\%$

3 Testing site

Test laboratory:	Aerospace Testing Technology (Shenzhen) Co., Ltd.
Laboratory location:	1/F, Block A4, No. 5, 8th Road, Shapu Yangyong Industrial Park, Songgang Street, Bao'an District, Shenzhen, Guangdong, China
Telephone:	+ 086 0755-27781492
Fax:	ast@hangtianjc.com

Note:

1. Instrument and equipment calibration laboratory:

Test laboratory:	Shenzhen Supersonic Measurement And Control Technology Co., Ltd.
Laboratory location:	B2 Building 101, Jinweiyuan Industrial Plant Area, Julongshan District, Longtian Street Industrial Zone, Pingshan District, Shenzhen, Guangdong, China.
Telephone:	+ 086 0755-84636042
Fax:	ranguangfu@supersonic-mc.com

3. Test software

Software name	Manufacturer	Model	Version
Conducted	Farad	EZ-EMC	Ver.EMC-CON 3A1.1
Radiated	Farad	EZ-EMC	Ver.FA-03A2 RE
Harmonics and flicker test system	TTI	HA-PC Link	V3.04
EFT test	EMTEST	IEC .CONTROL	V6.02a01
Surge test	EMTEST	IEC .CONTROL	V6.02a01
Dips test	EMTEST	IEC .CONTROL	V6.02a01

4 List of test equipment

Item	Equipment name	Manufacturer	Model	Serial No.	Calibration date	Due date
1	EMI Test Receiver	Rohde&schwarz	ESPI7	100605	2022.3.09	2023.3.08
2	EMI Test Receiver	Rohde&schwarz	ESCI3	102696	2022.3.09	2023.3.08
3	Broadband antenna	schwarabeck	VULB9168	1064	2022.3.11	2024.3.10
4	Horn antenna	schwarabeck	BBHA9120D	9120D-1145	2022.3.11	2024.3.10
5	Harmonic analysis and Voltage flicker tester	Laplace Instruments LTD	AC 2000A	311345	2022.3.13	2023.3.12
6	AC power source	MToni	HPF5010	632624	2022.3.09	2023.3.08
7	Amplifier	EMtrace	RP01A	50117	2022.3.09	2023.3.08
8	Artificial power network	schwarabeck	NSLK8127	8127483	2022.3.09	2023.3.08
9	Artificial power network	ETS	3186/2NM	1132	2022.3.09	2023.3.08
10	ESD Simulator	Noiseken	ESS-2002EX	ESS1070472	2022.3.11	2023.3.10
11	10dB attenuator	HUBER+SUHNER	10dB	/	2022.3.09	2023.3.08
12	AC SOURCE	EMTEST	MV2616	V0523100467	2022.3.09	2023.3.08
13	Combined immunity simulator	EMTEST	UCS500-M	V0523100465	2022.3.09	2023.3.08
14	amplifier	Space-Dtronics	EWLAN0118G -P40	19113001	2022.3.09	2023.3.08
15	Loop antenna	schwarabeck	FMZB 1519 B	FMZB 1519 B	2022.3.11	2024.3.10
16	Spectrum analyzer	KEYSIGHT	N9020A	MY55370280	2022.3.09	2023.3.08
17	Impedance stabilized network	schwarabeck	NTFM 8158	#214	2022.3.09	2023.3.08

For RF Field Strength Susceptibility test equipment:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal	Cal. Interval
1.	vector Signal Generator	Agilent	E4438C	US44271917	2021.08.24	1 Year
2.	Power meter	Agilent	E4419B	GB40202122	2021.08.24	1 Year
3.	Power Sensor	Agilent	E9300A	MY41496625	2021.08.24	1 Year
4.	RF power Amplifier	OPHIR	5225R	1045	N/A	NCR
5.	RF power Amplifier	OPHIR	5273R	1018	N/A	NCR
6.	Antenna	SCHWARZBECK	STLP9128E-special	STLP9128E s#139	N/A	NCR
7.	Antenna	SCHWARZBECK	STLP9128E-special	STLP 9149 #456	N/A	NCR

For Injected currents susceptibility test equipment:

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Conducted Immunity Test System	SKET	CITS_150 K230M	SK2019101 001_CITS	2021.11.07	1 Year
2.	Fixed Coaxial Attenuator (6dB Attenuation)	CD	ATT-0675	120540086	2021.08.24	1 Year
3.	coupling-decoupling network (CDN)	CD	CDN M2/M3	2302	2021.08.24	1 Year
4.	Electromagnetic Injection Clamp (EMC-Clamp)	CD	EM-Clamp	0513A031201	2021.08.24	1 Year

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Note: The calibration interval of the above test instruments is 12 or 24 months and the calibrations are traceable to international system unit (SI).

5 Emission test

5.1 Conducted emission

5.1.1 Limits

Conducted Emissions were measured from 150KHz to 30MHz with a bandwidth of 9KHz and return leads of the EUT according to the methods defined in standard EN55032.

Table A.9 – Requirements for conducted emissions from the AC mains power ports of Class A equipment

Applicable to				
1. AC mains power ports (3.1.1)				
Table clause	Frequency range MHz	Coupling device (see Table A.8)	Detector type / bandwidth	Class A limits dB(μV)
A9.1	0,15 to 0,5	AMN	Quasi Peak / 9 kHz	79
	0,5 to 30			73
A9.2	0,15 to 0,5	AMN	Average / 9 kHz	66
	0,5 to 30			60

Apply A9.1 and A9.2 across the entire frequency range.

Table A.10 – Requirements for conducted emissions from the AC mains power ports of Class B equipment

Applicable to				
1. AC mains power ports (3.1.1)				
Table clause	Frequency range MHz	Coupling device (see Table A.8)	Detector type / bandwidth	Class B limits dB(μV)
A10.1	0,15 to 0,5	AMN	Quasi Peak / 9 kHz	66 to 56
	0,5 to 5			56
	5 to 30			60
A10.2	0,15 to 0,5	AMN	Average / 9 kHz	56 to 46
	0,5 to 5			46
	5 to 30			50

Apply A10.1 and A10.2 across the entire frequency range.

Table A.11 – Requirements for asymmetric mode conducted emissions from Class A equipment

Applicable to					
1. wired network ports (3.1.32) 2. optical fibre ports (3.1.25) with metallic shield or tension members 3. antenna ports (3.1.3)					
Table clause	Frequency range MHz	Coupling device (see Table A.8)	Detector type / bandwidth	Class A voltage limits dB(μV)	Class A current limits dB(μA)
A11.1	0.15 to 0.5	AAN	Quasi Peak / 9 kHz	97 to 87	n/a
	0.5 to 30			87	
	0.15 to 0.5	AAN	Average / 9 kHz	84 to 74	
	0.5 to 30			74	
A11.2	0.15 to 0.5	CVP and current probe	Quasi Peak / 9 kHz	97 to 87	53 to 43
	0.5 to 30			87	43
	0.15 to 0.5	CVP and current probe	Average / 9 kHz	84 to 74	40 to 30
	0.5 to 30			74	30
A11.3	0.15 to 0.5	Current Probe	Quasi Peak / 9 kHz	n/a	53 to 43
	0.5 to 30				43
	0.15 to 0.5	Current Probe	Average / 9 kHz		40 to 30
	0.5 to 30				30
The choice of coupling device and measurement procedure is defined in Annex C. AC mains ports that also have the function of a wired network port shall meet the limits given in Table A.9. The measurement shall cover the entire frequency range. The application of the voltage and/or current limits is dependent on the measurement procedure used. Refer to Table C.1 for applicability. Testing is required at only one EUT supply voltage and frequency. Applicable to ports listed above and intended to connect to cables longer than 3 m.					

Table A.12 – Requirements for asymmetric mode conducted emissions from Class B equipment

Applicable to					
1. wired network ports (3.1.32) 2. optical fibre ports (3.1.25) with metallic shield or tension members 3. broadcast receiver tuner ports (3.1.8) 4. antenna ports (3.1.3)					
Table clause	Frequency range MHz	Coupling device (see Table A.8)	Detector type / bandwidth	Class B voltage limits dB(μV)	Class B current limits dB(μA)
A12.1	0,15 to 0,5	AAN	Quasi Peak / 9 kHz	84 to 74	n/a
	0,5 to 30			74	
	0,15 to 0,5	AAN	Average / 9 kHz	74 to 64	
	0,5 to 30			64	
A12.2	0,15 to 0,5	CVP and current probe	Quasi Peak / 9 kHz	84 to 74	40 to 30
	0,5 to 30			74	30
	0,15 to 0,5	CVP and current probe	Average / 9 kHz	74 to 64	30 to 20
	0,5 to 30			64	20
A12.3	0,15 to 0,5	Current Probe	Quasi Peak / 9 kHz	n/a	40 to 30
	0,5 to 30				30
	0,15 to 0,5	Current Probe	Average / 9 kHz		30 to 20
	0,5 to 30				20
The choice of coupling device and measurement procedure is defined in Annex C. Screened ports including TV broadcast receiver tuner ports are measured with a common-mode impedance of 150 Ω. This is typically accomplished with the screen terminated by 150 Ω to earth. AC mains ports that also have the function of a wired network port shall meet the limits given in Table A.10. The measurement shall cover the entire frequency range. The application of the voltage and/or current limits is dependent on the measurement procedure used. Refer to Table C.1 for applicability. Measurement is required at only one EUT supply voltage and frequency. Applicable to ports listed above and intended to connect to cables longer than 3 m.					

5.1.2 Test Procedures

For table-top equipment

5.1.2.1 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 centre forming a bundle 30 to 40 cm long.

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

5.1.2.2 The EUT was put on a wooden table which was 0.8 m high above the ground and connected to the PC through the Artificial Mains Network (ISN). Where the signal cable supplied by the manufacture was longer than 1 m, the excess was folded back and forth parallel to the cable at the center so as to form a bundle no longer than 0.4 m.

For floor standing equipment

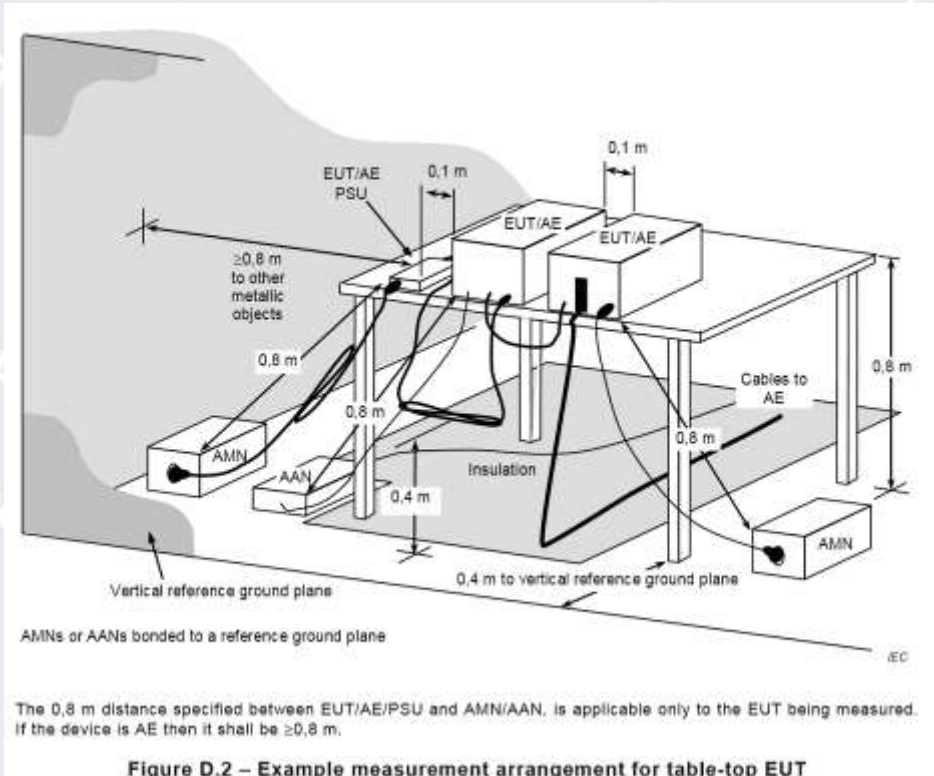
5.1.2.3 The EUT placed on the horizontal ground reference plane, orientated for normal use, but separated from metallic contact with the ground reference plane by up to 15 cm of insulation. EUT being connected to the power mains through an artificial mains networks (AMN). All other support equipment powered from additional AMN. The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.

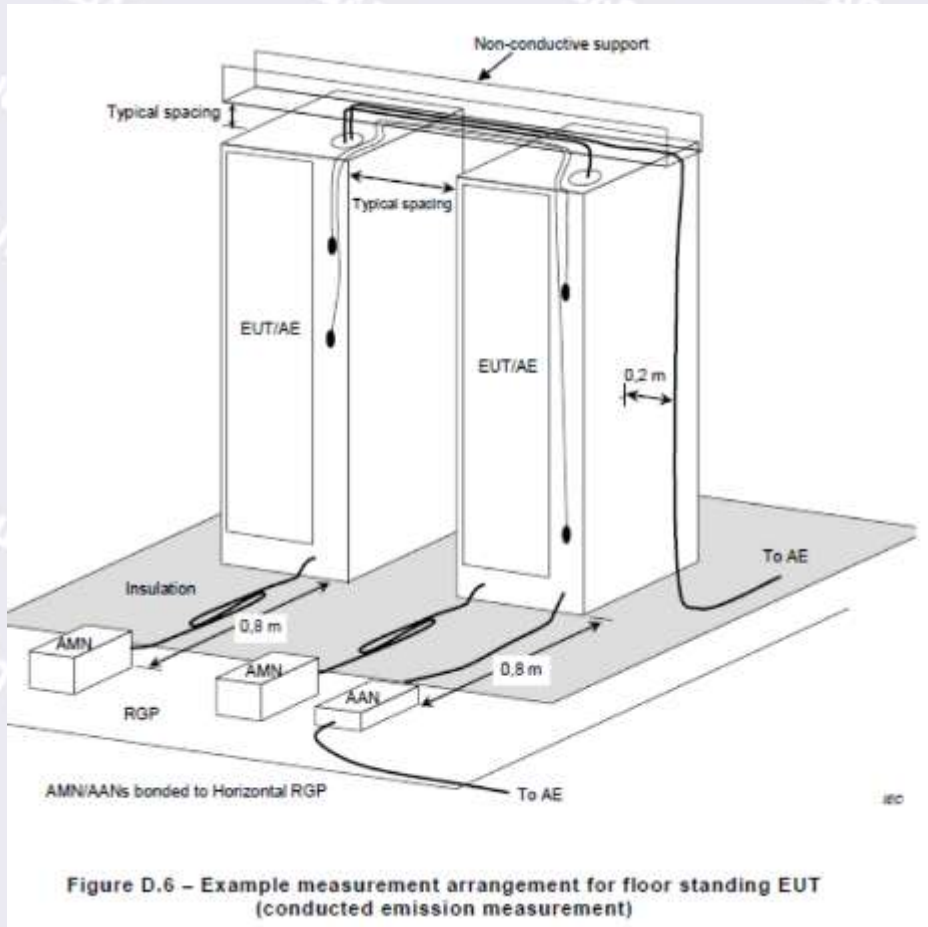
The cables cables shall be insulated (by up to 15 cm) from the horizontal ground reference plane. If the equipment requires a dedicated ground connection, then this shall be provided and bonded to the horizontal ground plane.

Intra-unit cables (between units forming the EUT or between the EUT and an associated equipment) shall drape to, but remain insulated from, the horizontal ground reference plane. Any excess shall either be folded at the cable center into a bundle no longer than 0,4 m or arranged in a serpentine fashion.

5.1.2.4 The EUT was put on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by up to 15 cm of insulation, EUT connected to the PC through the Artificial Mains Network (ISN). Where the signal cable supplied by the manufacture was longer than 1 m, the excess was folded back and forth parallel to the cable at the center so as to form a bundle no longer than 0.4 m.

5.1.3 Test setup



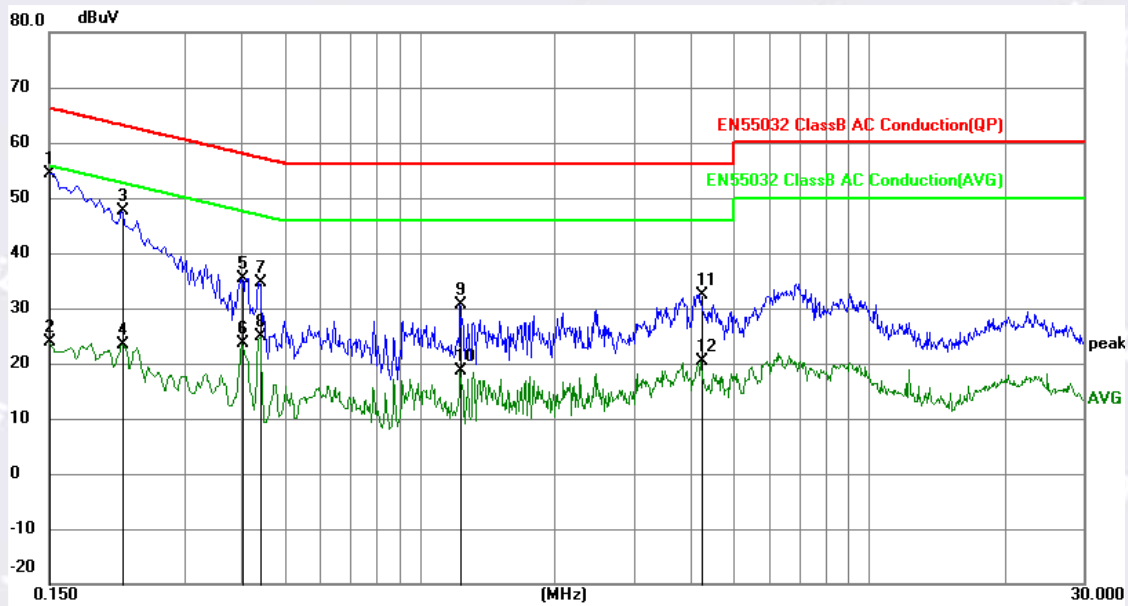


5.1.4 Test Result and data

Conducted Test (AC ports)

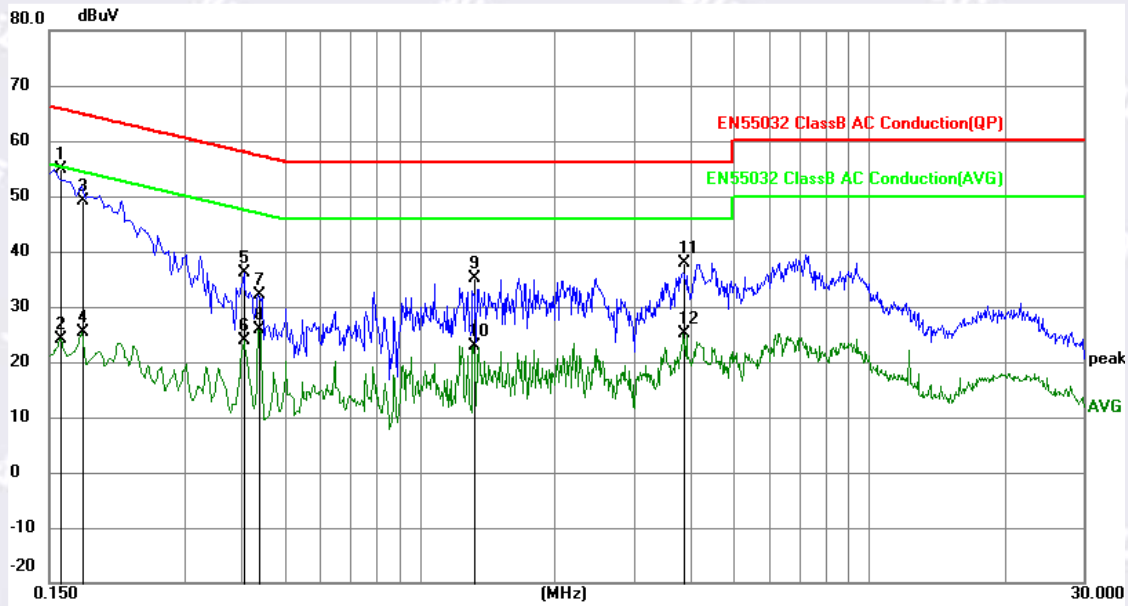
Remark: Level=Reading + Factor, Margin=Level-Limit

Test mode:	Mode 1		
Temperature:	25.6°C	Humidity:	55%RH
Pressure:	101kPa	Test voltage:	AC 230V/50Hz
Phase:	L	Test Result	PASS



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	41.95	12.49	54.44	66.00	-11.56	QP
2	0.1500	11.49	12.49	23.98	56.00	-32.02	AVG
3	0.2175	35.24	12.44	47.68	62.91	-15.23	QP
4	0.2175	10.99	12.44	23.43	52.91	-29.48	AVG
5	0.4020	23.12	12.38	35.50	57.81	-22.31	QP
6	0.4020	11.20	12.38	23.58	47.81	-24.23	AVG
7	0.4425	22.26	12.37	34.63	57.01	-22.38	QP
8	0.4425	12.61	12.37	24.98	47.01	-22.03	AVG
9	1.2345	18.42	12.29	30.71	56.00	-25.29	QP
10	1.2345	6.34	12.29	18.63	46.00	-27.37	AVG
11	4.2270	20.16	12.33	32.49	56.00	-23.51	QP
12	4.2270	7.95	12.33	20.28	46.00	-25.72	AVG

Test mode:	Mode 1		
Temperature:	25.6°C	Humidity:	55%RH
Pressure:	101kPa	Test voltage:	AC 230V/50Hz
Phase:	N	Test Result	PASS



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1590	42.31	12.48	54.79	65.52	-10.73	QP
2	0.1590	11.55	12.48	24.03	55.52	-31.49	AVG
3	0.1768	36.63	12.47	49.10	64.63	-15.53	QP
4	0.1768	12.86	12.47	25.33	54.63	-29.30	AVG
5	0.4063	23.71	12.37	36.08	57.72	-21.64	QP
6	0.4063	11.51	12.37	23.88	47.72	-23.84	AVG
7	0.4380	19.69	12.37	32.06	57.10	-25.04	QP
8	0.4380	13.40	12.37	25.77	47.10	-21.33	AVG
9	1.3200	22.85	12.29	35.14	56.00	-20.86	QP
10	1.3200	10.54	12.29	22.83	46.00	-23.17	AVG
11	3.8669	25.66	12.32	37.98	56.00	-18.02	QP
12	3.8669	12.70	12.32	25.02	46.00	-20.98	AVG

5.2 Radiated emission

5.2.1 Limits

The EUT shall meet the limits of below table when measured at the measuring distance R in accordance with the methods described in European standard EN55032.

Table 1 – Required highest frequency for radiated measurement

Highest internal frequency (F_x)	Highest measured frequency
$F_x \leq 108$ MHz	1 GHz
108 MHz < $F_x \leq 500$ MHz	2 GHz
500 MHz < $F_x \leq 1$ GHz	5 GHz
$F_x > 1$ GHz	$5 \times F_x$ up to a maximum of 6 GHz

NOTE 1 For FM and TV broadcast receivers, F_x is determined from the highest frequency generated or used excluding the local oscillator and tuned frequencies.

NOTE 2 F_x is defined in 3.1.19.

Table A.2 – Requirements for radiated emissions at frequencies up to 1 GHz for Class A equipment

Table clause	Frequency range MHz	Measurement		Class A limits dB(μ V/m)
		Distance m	Detector type/ bandwidth	OATS/SAC (see Table A.1)
A2.1	30 – 230	10	Quasi Peak / 120 kHz	40
	230 – 1 000			47
A2.2	30 – 230	3		50
	230 – 1 000			57

NOTE Apply only A2.1 or A2.2 across the entire frequency range.

Table A.3 – Requirements for radiated emissions at frequencies above 1 GHz for Class A equipment

Table clause	Frequency range MHz	Measurement		Class A limits dB(μ V/m)
		Distance m	Detector type/ bandwidth	FSOATS (see Table A.1)
A3.1	1 000 – 3 000	3	Average / 1 MHz	56
	3 000 – 6 000			60
A3.2	1 000 – 3 000		Peak / 1 MHz	76
	3 000 – 6 000			80

Table A.4 – Requirements for radiated emissions at frequencies up to 1 GHz for Class B equipment

Table clause	Frequency range MHz	Measurement		Class B limits dB(μV/m)	
		Distance m	Detector type/ bandwidth	OATS/SAC (see Table A.1)	
A4.1	30 – 230	10	Quasi Peak / 120 kHz	30	
	230 – 1 000			37	
A4.2	30 – 230	3		40	
	230 – 1 000			47	

Table A.5 – Requirements for radiated emissions at frequencies above 1 GHz for Class B equipment

Table clause	Frequency range MHz	Measurement		Class B limits dB(μV/m)	
		Distance m	Detector type/ bandwidth	FSOATS (see Table A.1)	
A5.1	1 000 – 3 000	3	Average/ 1 MHz	50	
	3 000 – 6 000			54	
A5.2	1 000 – 3 000		Peak/ 1 MHz	70	
	3 000 – 6 000			74	

Table A.6 – Requirements for radiated emissions from FM receivers

Table clause	Frequency range MHz	Measurement		Class B limit dB(μV/m)	
		Distance m	Detector type/ bandwidth	Fundamental	Harmonics
				OATS/SAC (see Table A.1)	OATS/SAC (see Table A.1)
A6.1	30 – 230	10	Quasi peak/ 120 kHz	50	42
	230 – 300				42
	300 – 1 000				46
A6.2	30 – 230	3		60	52
	230 – 300				52
	300 – 1 000				56

Table A.12 – Requirements for conducted differential voltage emissions from Class B equipment

Applicable to						
1. TV broadcast receiver tuner ports (3.1.8) with an accessible connector						
2. RF modulator output ports (3.1.27)						
3. FM broadcast receiver tuner ports (3.1.8) with an accessible connector						
Table clause	Frequency range MHz	Detector type/ bandwidth	Class B limits dB(μ V) 75 Ω			Applicability
			Other	Local Oscillator Fundamental	Local Oscillator Harmonics	
A12.1	30 – 950	For frequencies ≤ 1 GHz	46	46	46	See NOTE 1
	950 – 2 150		46	54	54	
A12.2	950 – 2 150	Quasi Peak/ 120 kHz	46	54	54	See NOTE 2
A12.3	30 – 300		For frequencies ≥ 1 GHz	46	54	50
	300 – 1 000	52				
A12.4	30 – 300	Peak/ 1 MHz	46	76	59	See NOTE 4
	300 – 1 000				52	
A12.5	30 – 950	Peak/ 1 MHz	46	n/a	46	See NOTE 5
	950 – 2 150				54	

NOTE 1 Television receivers (analogue or digital), video recorders and PC TV broadcast receiver tuner cards working in channels between 30 MHz and 1 GHz, and digital audio receivers.

NOTE 2 Tuner units (not the LNB) for satellite signal reception.

NOTE 3 Frequency modulation audio receivers and PC tuner cards.

NOTE 4 Frequency modulation car radios.

NOTE 5 Applicable to EUTs with RF modulator output ports (for example DVD equipment, video recorders, camcorders and decoders etc.) designed to connect to TV broadcast receiver tuner ports.

NOTE 6 Testing is required at only one EUT supply voltage and frequency.

NOTE 7 The term 'other' refers to all emissions other than the fundamental and the harmonics of the local oscillator.

NOTE 8 The test shall be performed with the device operating at each reception channel.

NOTE 9 The test shall cover the entire frequency range.

5.2.2 Test Procedures

- a. The measuring distance of at 3/10 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 3 meter SAE 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 table-top equipment, place on a table top 0.8 meter above ground. For floor standing equipment, placed on the horizontal ground reference plane, orientated for normal use, but separated from metallic contact with the ground reference plane by up to 15 cm of insulation.
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

5.2.3 Test Setup

Radiated Emission Test Set-Up Frequency below 1 GHz

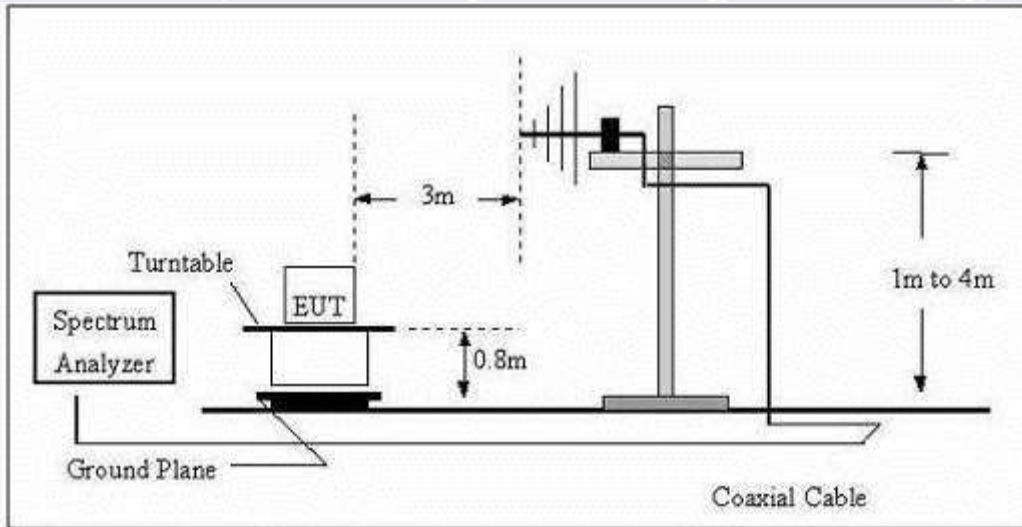
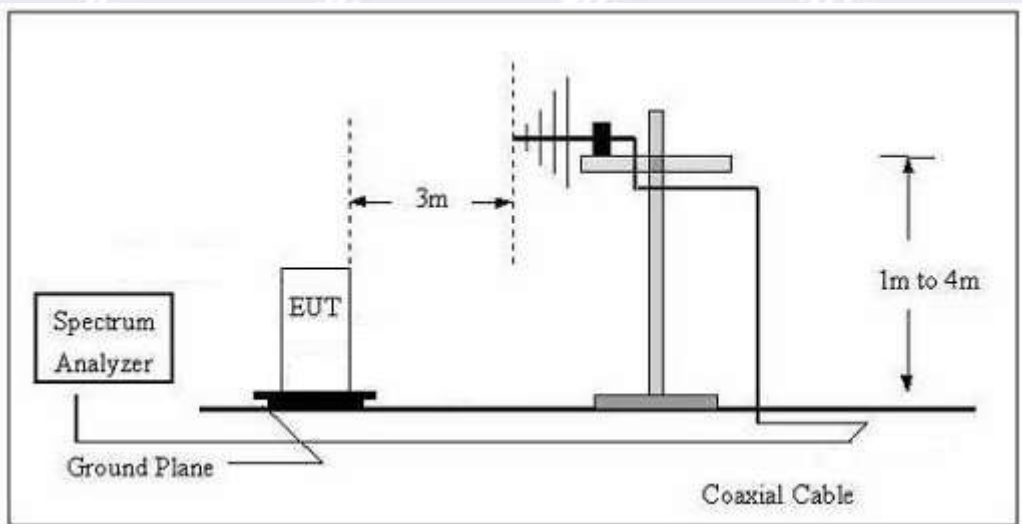


Table-top equipment



Floor standing equipment

Radiated Emission Test Set-Up Frequency above 1GHz

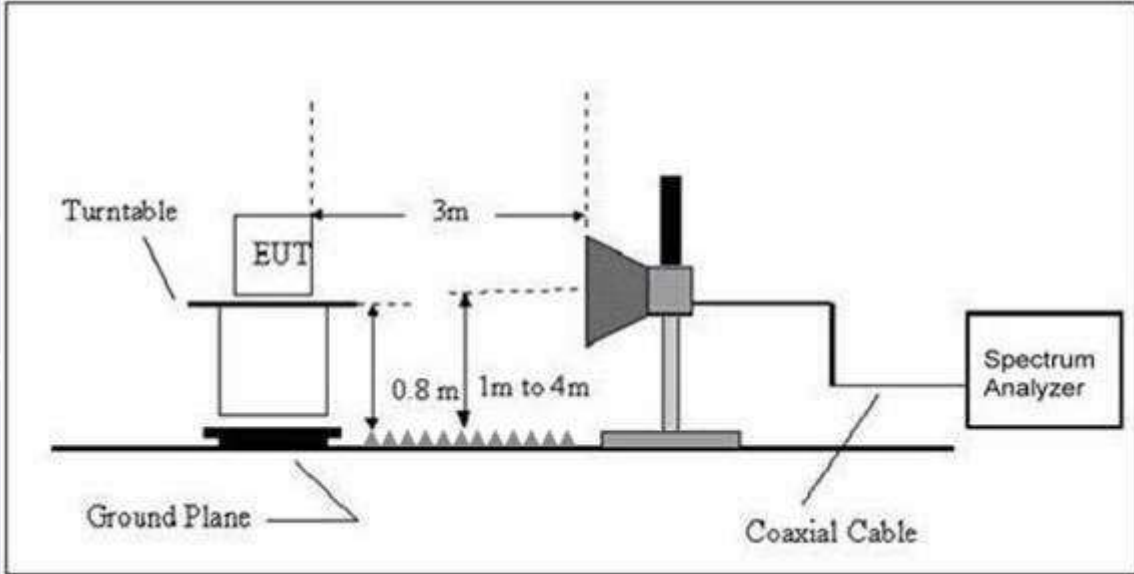
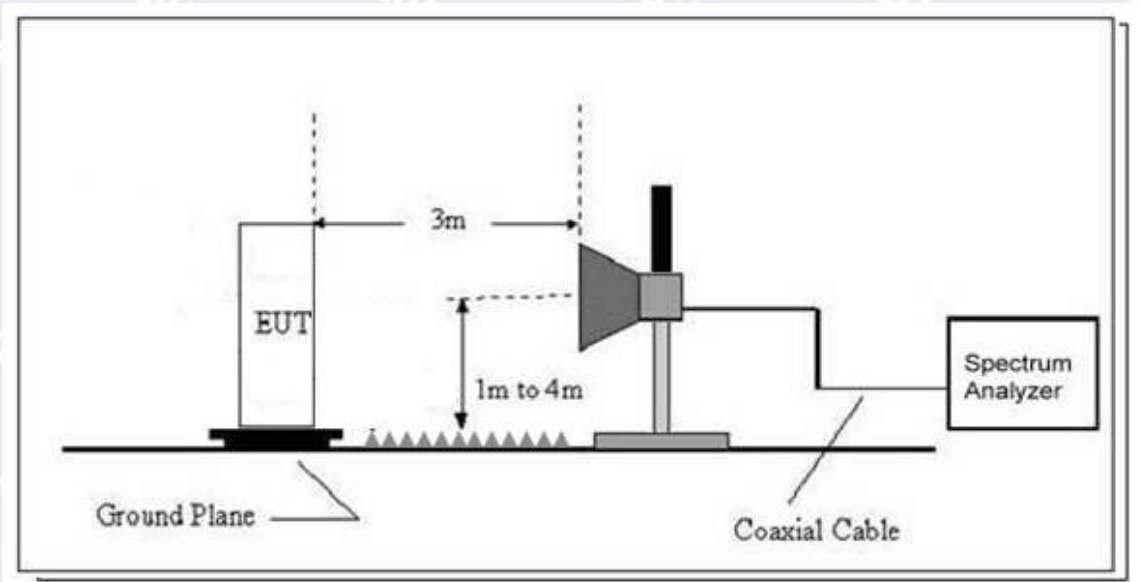


Table-top equipment

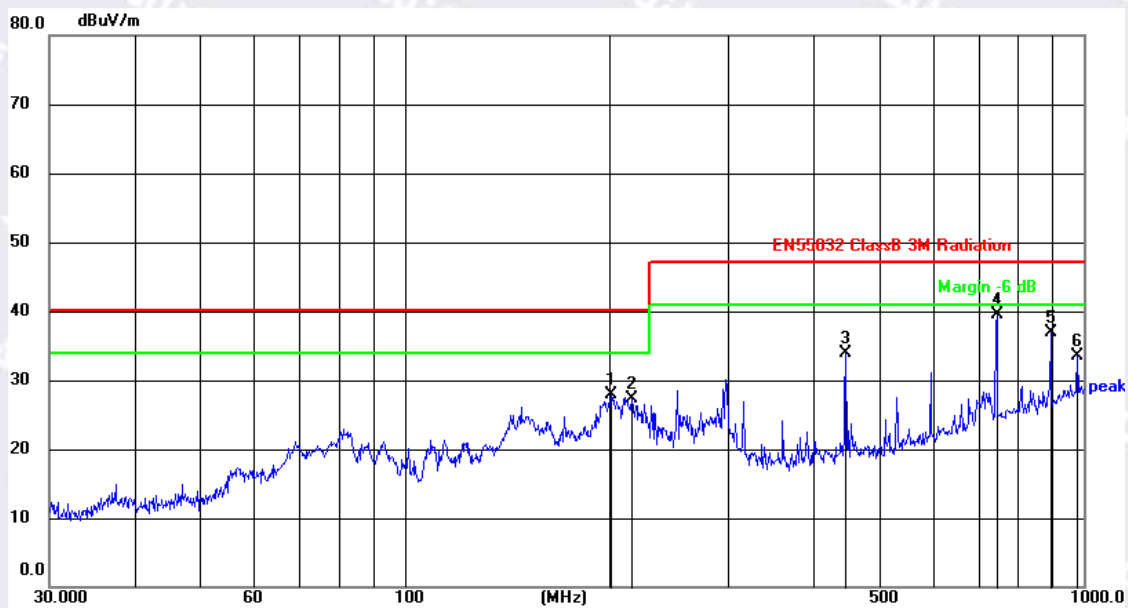


Floor standing equipment

5.2.4 Test Result and Data

30-1GHz

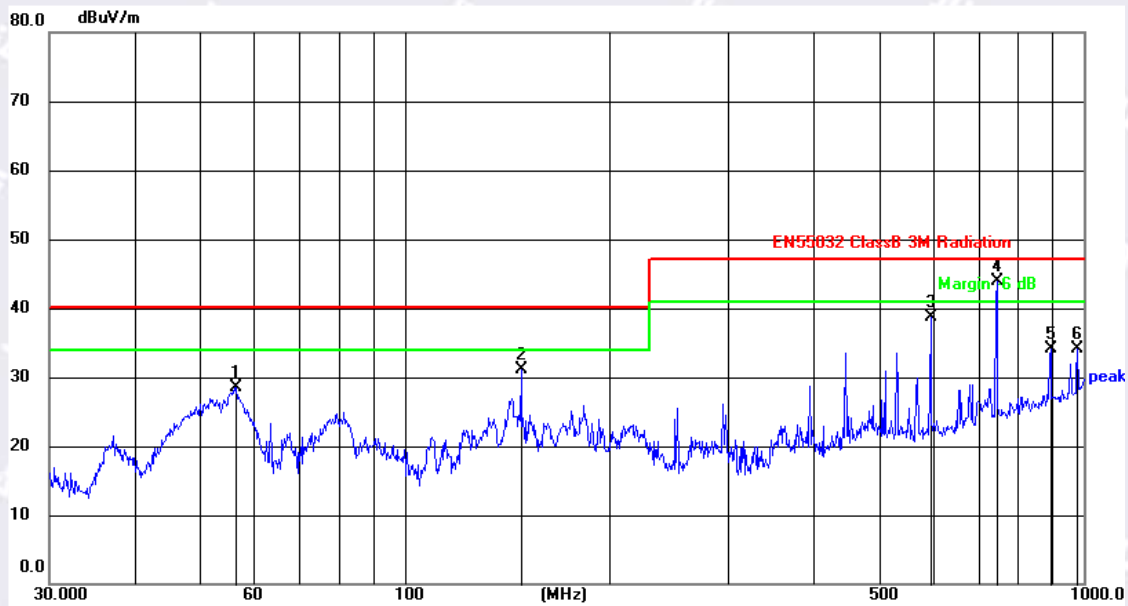
Test mode:	Mode 1		
Temperature:	24.9°C	Humidity:	56%RH
Pressure:	101kPa	Test voltage:	AC 230V/50Hz
Test polarization:	Horizontal	Test Result:	PASS



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	201.3930	46.47	-18.55	27.92	40.00	-12.08	QP
2	216.0239	45.83	-18.48	27.35	40.00	-12.65	QP
3	446.4140	48.78	-14.87	33.91	47.00	-13.09	QP
4	744.8660	47.77	-8.26	39.51	47.00	-7.49	QP
5	893.8566	43.59	-6.64	36.95	47.00	-10.05	QP
6	979.1804	39.11	-5.66	33.45	47.00	-13.55	QP

Measurement=Reading + Factor, Margin=Level-Limit

Test mode:	Mode 1		
Temperature:	24.9°C	Humidity:	56%RH
Pressure:	101kPa	Test voltage:	AC 230V/50Hz
Test polarization:	Vertical	Test Result:	PASS

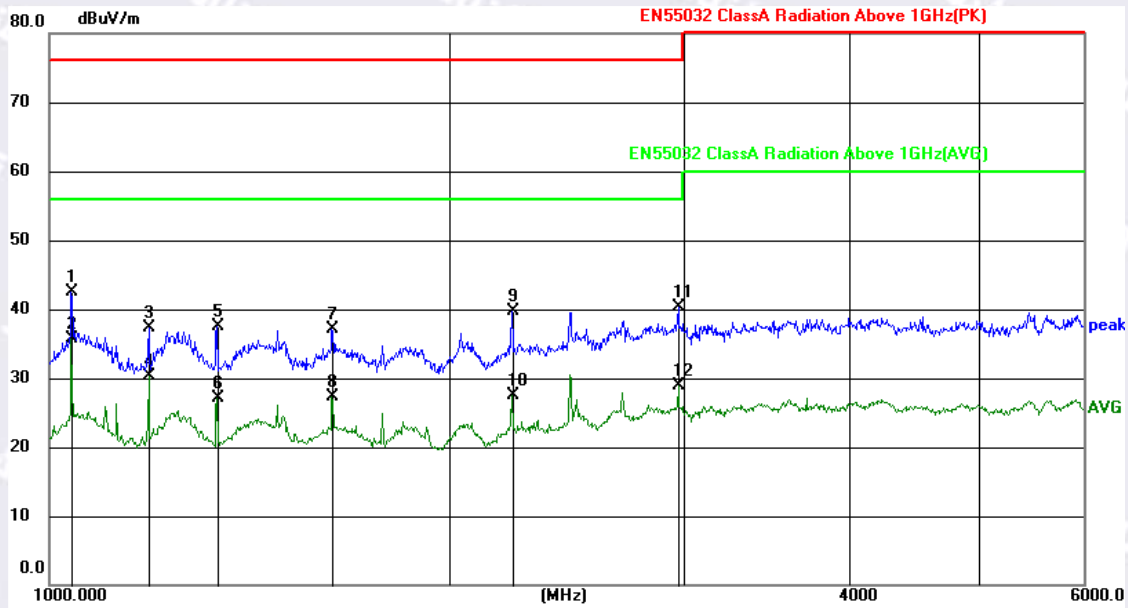


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	56.5929	49.31	-20.81	28.50	40.00	-11.50	QP
2	148.4410	50.13	-18.95	31.18	40.00	-8.82	QP
3	595.1329	50.03	-11.31	38.72	47.00	-8.28	QP
4	744.8661	52.15	-8.25	43.90	47.00	-3.10	QP
5	893.8567	40.17	-5.99	34.18	47.00	-12.82	QP
6	979.1804	38.21	-4.07	34.14	47.00	-12.86	QP

Measurement=Reading + Factor, Margin=Level-Limit

Above 1GHz

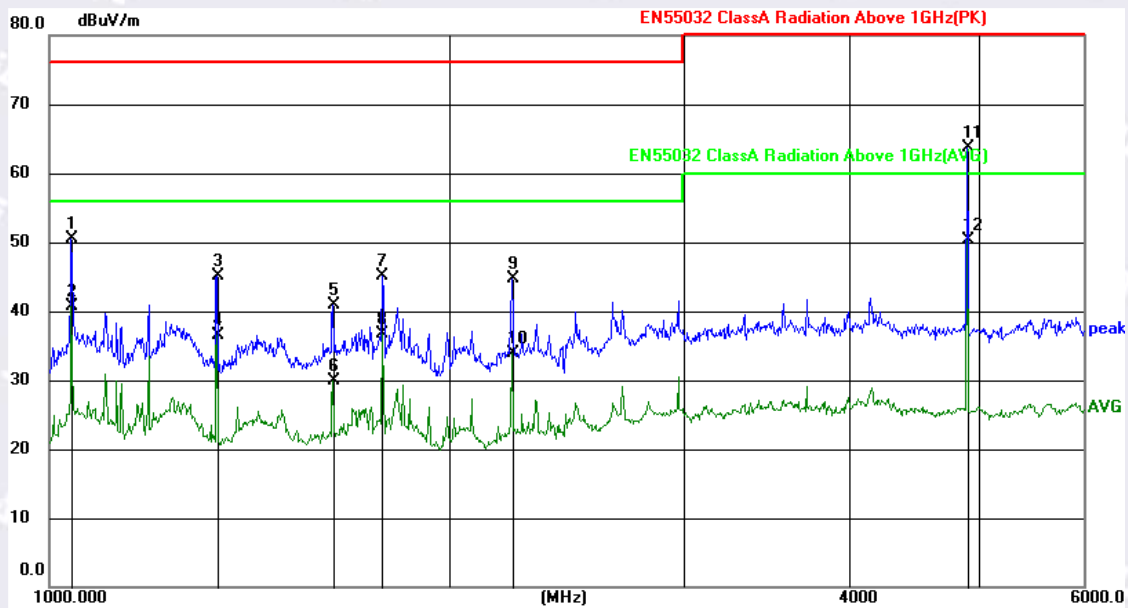
Test mode:	Mode 1		
Temperature:	24.9°C	Humidity:	56%RH
Pressure:	101kPa	Test voltage:	AC 230V/50Hz
Test polarization:	Horizontal	Test Result:	PASS



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1038.344	58.04	-15.52	42.52	76.00	-33.48	peak
2	1038.344	51.16	-15.52	35.64	56.00	-20.36	AVG
3	1187.688	52.85	-15.60	37.25	76.00	-38.75	peak
4	1187.688	45.84	-15.60	30.24	56.00	-25.76	AVG
5	1336.782	53.15	-15.69	37.46	76.00	-38.54	peak
6	1336.782	42.86	-15.69	27.17	56.00	-28.83	AVG
7	1630.930	52.94	-15.84	37.10	76.00	-38.90	peak
8	1630.930	43.20	-15.84	27.36	56.00	-28.64	AVG
9	2227.582	54.81	-15.13	39.68	76.00	-36.32	peak
10	2227.582	42.55	-15.13	27.42	56.00	-28.58	AVG
11	2972.460	52.43	-12.18	40.25	76.00	-35.75	peak
12	2972.460	41.15	-12.18	28.97	56.00	-27.03	AVG

Measurement=Reading + Factor, Margin=Level-Limit

Test mode:	Mode 1		
Temperature:	24.9°C	Humidity:	56%RH
Pressure:	101kPa	Test voltage:	AC 230V/50Hz
Test polarization:	Vertical	Test Result:	PASS



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	1038.344	65.98	-15.52	50.46	76.00	-25.54	peak
2	1038.344	56.21	-15.52	40.69	56.00	-15.31	AVG
3	1336.782	60.76	-15.69	45.07	76.00	-30.93	peak
4	1336.782	52.10	-15.69	36.41	56.00	-19.59	AVG
5	1633.855	56.84	-15.85	40.99	76.00	-35.01	peak
6	1633.855	45.81	-15.85	29.96	56.00	-26.04	AVG
7	1780.593	60.95	-15.92	45.03	76.00	-30.97	peak
8	1780.593	52.58	-15.92	36.66	56.00	-19.34	AVG
9	2227.582	59.89	-15.13	44.76	76.00	-31.24	peak
10	2227.582	48.97	-15.13	33.84	56.00	-22.16	AVG
11	4900.272	73.47	-9.76	63.71	80.00	-16.29	peak
12	4900.272	60.12	-9.76	50.36	60.00	-9.64	AVG

Measurement=Reading + Factor, Margin=Level-Limit

5.3 Harmonic current emission

5.3.1 Limits

Limits for Class A Equipment

Harmonics Order n	Max. permissible harmonics current A	Harmonics Order n	Max. permissible harmonics current A
Odd harmonics		Even harmonics	
3	2.30	2	1.08
5	1.14	4	0.43
7	0.77	6	0.30
9	0.40	8 ≤ n ≤ 40	0.23 × 8/n
11	0.33		
13	0.21		
15 ≤ n ≤ 39	0.15 × 15/n		

Limits for Class B Equipment

For Class B Equipment, the harmonics of the input current shall not exceed the values give in table that the limits of Class A multiplied by a factor of 1.5

Limits for Class C Equipment

Harmonics Order n	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	$30 \cdot \lambda^*$
5	10
7	7
9	5
11 < n < 39 (odd harmonics only)	3

* λ is the circuit power factor

Limits for Class D Equipment

Harmonics Order n	Maximum permissible harmonic current per watt mA/W	Maximum permissible harmonic current A
3	3.4	2.30
5	1.9	1.14
7	1.0	0.77
9	0.5	0.40
11	0.35	0.33
11 < n < 39 (odd harmonics only)	3.85/n	See limit of Class A

Remark: According to EN61000-3-2, the above limits for all equipment except for lighting equipment having an active input power above 75W and no limits apply for equipment with an active input power up to and including 75W

Aerospace Testing Technology (Shenzhen) Co., Ltd.

101, Block A4, No. 5, 8th Road, Shapu Yangyong Industrial Park,
Songgang Street, Bao'an District, Shenzhen, Guangdong, China

Tel.: .086-0755-27781492

Fax.: 086-0755-27781492

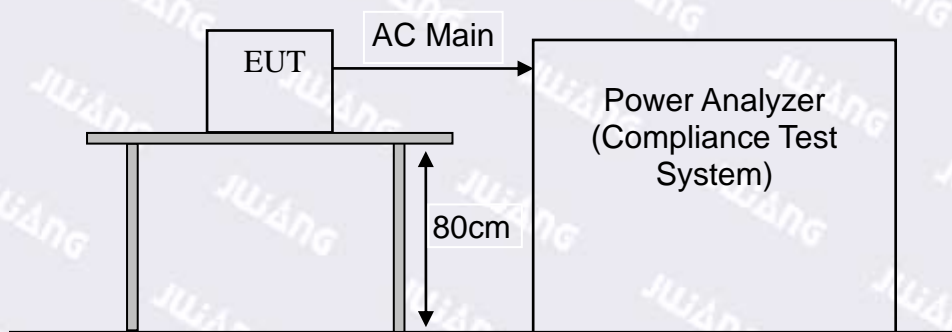
Web.: www.ast-test.com

E-mail: ast@hangtianjc.com

5.3.2 Test Procedures

The EUT was placed on the top of a wooden table 0.8 meters above the ground 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 emanated from EUT is chosen. The measure time shall be not less than the necessary for the EUT to be exercised.

5.3.3 Test Setup



5.3.4 Test Result and data

Test Result: N/A

5.4 Voltage fluctuations & flicker

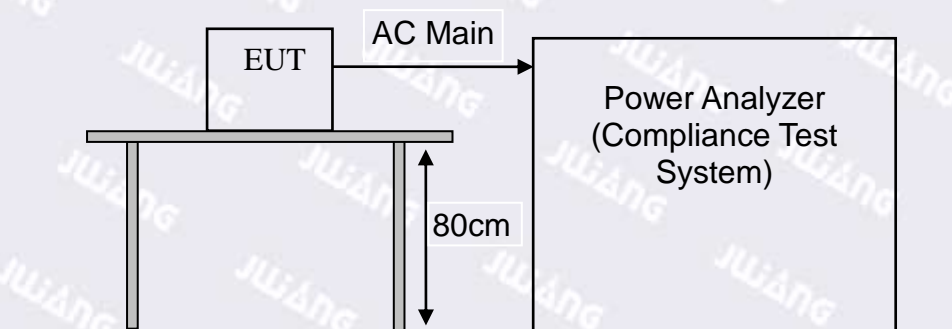
5.4.1 Limits

Test Item	Limit	Note
Pst	1.0	Pst means Short-term flicker indicator
Plt	0.65	Plt means long-term flicker indicator
dmax(%)	4%	dmax means maximum relative voltage change.
dc(%)	3%	dc means relative steady-state voltage change.

5.4.2 Test Procedures

The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the most unfavorable sequence of voltage changes under normal conditions. During the flick measurement, the measure time shall include that part of whole operation changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

5.4.3 Test Setup



5.4.4 Test Result and data

Test Result: N/A

6 Immunity test

6.1 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 5 000 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 5 000 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.

6.2 Electrostatic discharge immunity (ESD)

6.2.1 Test Method

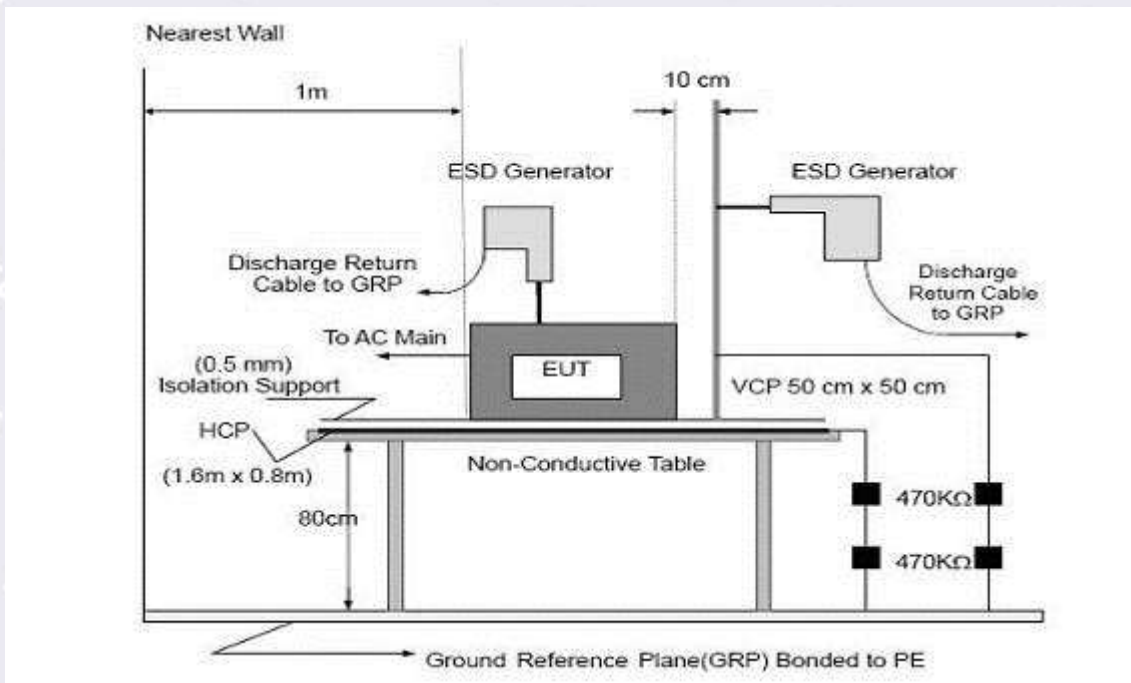
The test method shall be in accordance with EN 61000-4-2.

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).

6.2.2 Test Setup



6.2.3 Test Severity levels

Contact Discharge		Air Discharge	
Level	Test Voltage (kV) of Contact discharge	Level	Test Voltage (kV) of Air Discharge
1	±2	1	±2
2	±4	2	±4
3	±6	3	±8
4	±8	4	±15
X	Specified	X	Specified

Remark: "X" is an open level.

6.2.4 Test Result and data

Test Result : PASS
 Basic standard : EN 61000-4-2
 Product standard : EN 301489-1/17
 Atmospheric Pressure : 101KPa
 Temperature : 25.5°C
 Relative Humidity : 58%RH
 Test mode : Mode 1/2
 Performance requirements : B

Indirect discharge

Test Point	Contact discharge level (kV)	Number and polarity	Result
1. VCP-Front side	<input checked="" type="checkbox"/> ..2 <input checked="" type="checkbox"/> ..4	10 (+)	A
	<input type="checkbox"/> ..6 <input type="checkbox"/> ..8	10 (-)	A
2.VCP-Rear side	<input checked="" type="checkbox"/> ..2 <input checked="" type="checkbox"/> ..4	10 (+)	A
	<input type="checkbox"/> ..6 <input type="checkbox"/> ..8	10 (-)	A
3.VCP-Left side	<input checked="" type="checkbox"/> ..2 <input checked="" type="checkbox"/> ..4	10 (+)	A
	<input type="checkbox"/> ..6 <input type="checkbox"/> ..8	10 (-)	A
4. VCP-Right side	<input checked="" type="checkbox"/> ..2 <input checked="" type="checkbox"/> ..4	10 (+)	A
	<input type="checkbox"/> ..6 <input type="checkbox"/> ..8	10 (-)	A
5. HCP	<input checked="" type="checkbox"/> ..2 <input checked="" type="checkbox"/> ..4	10 (+)	A
	<input type="checkbox"/> ..6 <input type="checkbox"/> ..8	10 (-)	A

Direct discharge

Test Point	Contact discharge level(kV)	Air discharge level(kV)	Number and polarity	Result
Each nonconductive location touchable by hand	<input type="checkbox"/> ..2 <input type="checkbox"/> ..4	<input checked="" type="checkbox"/> ..2 <input checked="" type="checkbox"/> ..4	10 (+)	A
	<input type="checkbox"/> ..6 <input type="checkbox"/> ..8	<input type="checkbox"/> ..6 <input checked="" type="checkbox"/> ..8	10 (-)	A
Each conductive location touchable by hand	<input checked="" type="checkbox"/> ..2 <input checked="" type="checkbox"/> ..4	<input type="checkbox"/> ..2 <input type="checkbox"/> ..4	10 (+)	N/A
	<input type="checkbox"/> ..6 <input type="checkbox"/> ..8	<input type="checkbox"/> ..6 <input type="checkbox"/> ..8	10 (-)	N/A

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

6.3 RF electromagnetic field immunity (RS)

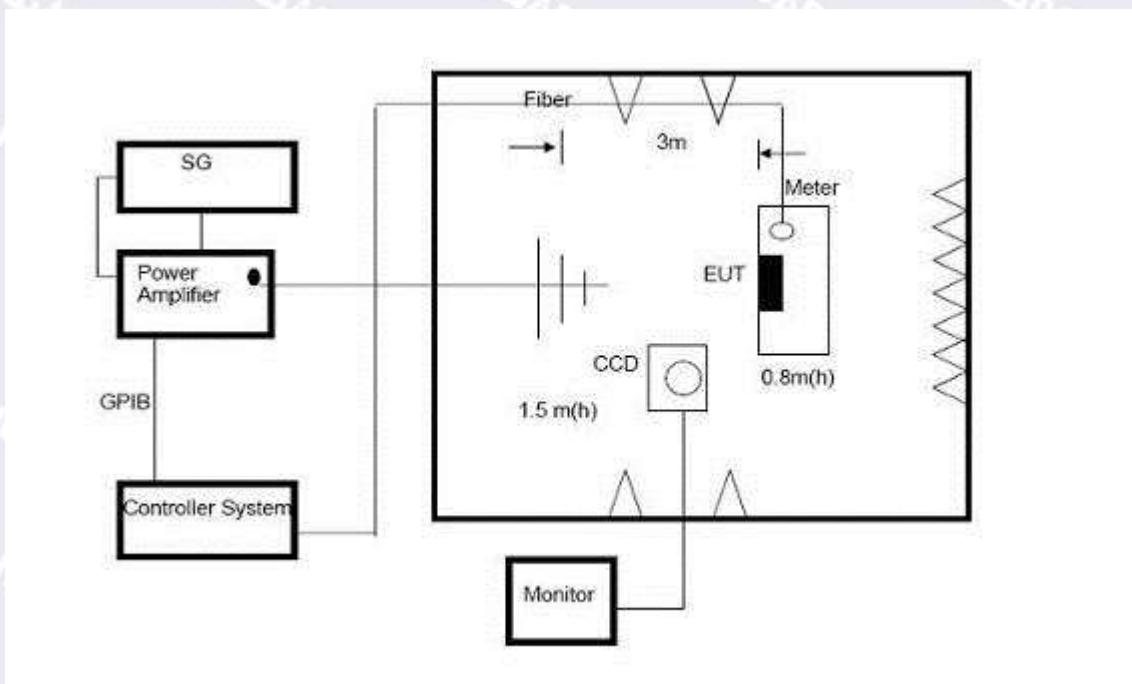
6.3.1 Test Method

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.

6.3.2 Test setup



6.3.3 Test Severity levels

Frequency Band : 80-6000 MHz	
Level	Test field strength (V/m)
1	1
2	3
3	10
X	Specified

Remark: "X" is an open class.

6.3.4 Test Result

Test Result	:	PASS
Basic standard	:	EN 61000-4-3
Product standard	:	EN 301489-17
Atmospheric Pressure	:	101KPa
Temperature	:	25.1°C
Relative Humidity	:	52%RH
Test mode	:	Mode 1
Performance requirements	:	A

Test data

Frequency (MHz)	Antenna polarization	Azimuth	Field Strength(V/m)	Result
80-6000	Vertical	Front	3 V/m	A
80-6000	Vertical	Rear	3 V/m	A
80-6000	Vertical	Left	3 V/m	A
80-6000	Vertical	Right	3 V/m	A
80-6000	Horizontal	Front	3 V/m	A
80-6000	Horizontal	Rear	3 V/m	A
80-6000	Horizontal	Left	3 V/m	A
80-6000	Horizontal	Right	3 V/m	A

Note:

1. The exclusion band has not been tested in 80MHz~6GHz.

The exclusion band for immunity testing of equipment operating in the 2,4 GHz band shall be: •
 lower limit of exclusion band = lowest allocated band edge frequency -120 MHz, i.e. 2 280 MHz; •
 upper limit of exclusion band = highest allocated band edge frequency +120 MHz, i.e. 2 603,5MHz.

2. "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.

6.4 Fast transients immunity (EFT)

6.4.1 Test Severity level

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

6.4.2 Test Procedures

The EUT and its simulators were placed on a ground reference plane and were insulated from it by a wood support 0.1m + 0.01m thick. The ground reference plane was 1m*1m metallic sheet with 0.65mm minimum thickness. This reference ground plane was project beyond the EUT by at least 0.1m on all sides and the minimum distance between EUT and all other conductive structure, except the ground plane was more than 0.5m. All cables to the EUT was placed on the wood support, cables not subject to EFT/B was routed as far as possible from the cable under test to minimize the coupling between the cables.

For input and output AC power ports:

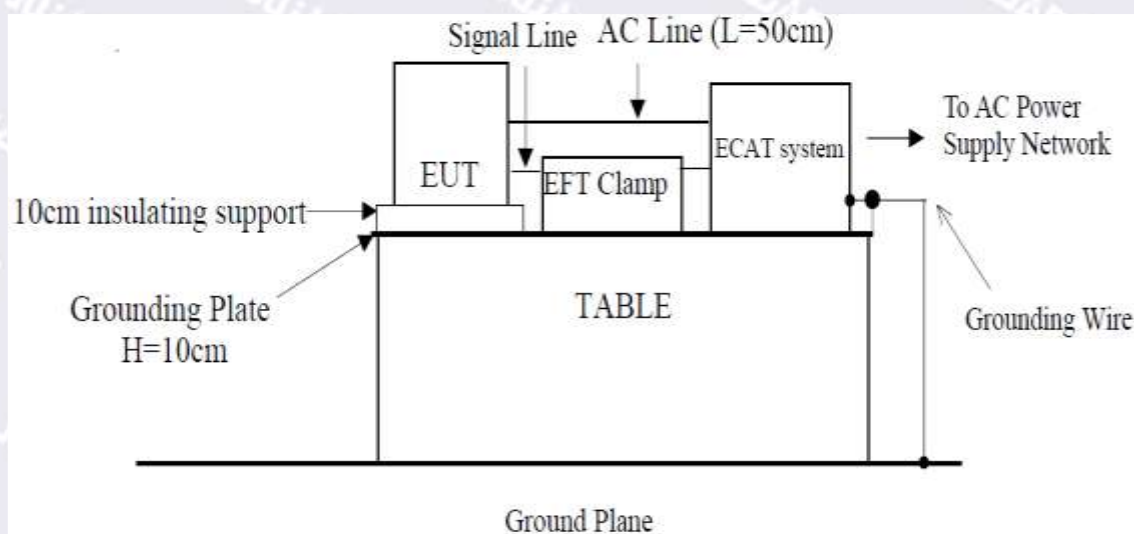
The EUT was connected to the power mains by using a coupling device that couples the EFT interference signal to AC power lines.

For signal lines and control lines ports:

The Coupling clamp is composed of a clamp unit for housing the cable, and was placed on the GRP.

The Coupling clamp provides the ability of coupling the fast transient/bursts to the cable under test

6.4.3 Test Setup



6.4.4 Test Result

Test Result : N/A
Basic standard : EN 61000-4-4
Product standard : EN 301489-1/7

6.5 Surges immunity

6.5.1 Test Severity level

Level	Open-circuit test voltage, $\pm 10\%$, kV
1	0.5
2	1.0
3	2.0
4	4.0
X	Specified

NOTE: "X" is an open class. This level can be specified in the product specification.

6.5.2 Test Procedure

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 1.2/50 μ s pulse as defined in EN 61000-4-5.

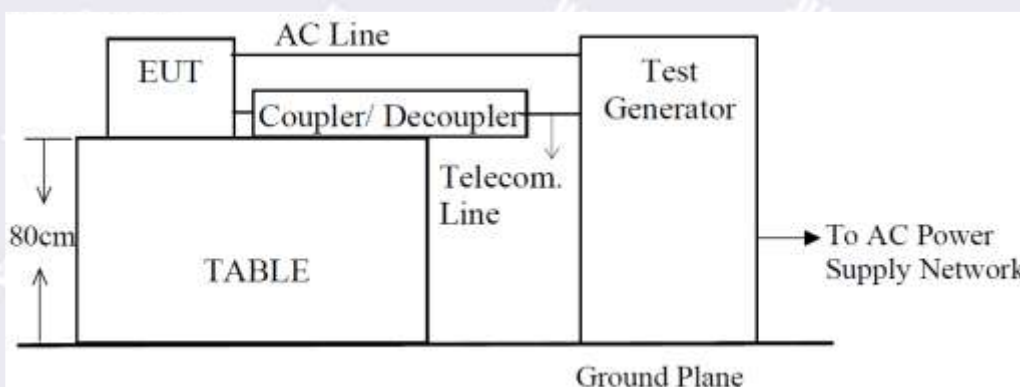
Test method for telecommunication ports connected to indoor cables:

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 1.2/50 μ s 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 1.2/50 μ s pulse as defined in EN 61000-4-5.

6.5.3 Test Setup



6.5.4 Test Result

Test Result : N/A
Basic standard : EN 61000-4-5
Product standard : EN 301489-17

6.6 Injected current immunity (CS)

6.6.1 Test Severity level

Level	Voltage Level (EMF),
1	1 V
2	3 V
3	10 V
x	Specified

NOTE - x is an open class. This level can be specified in the product specification.

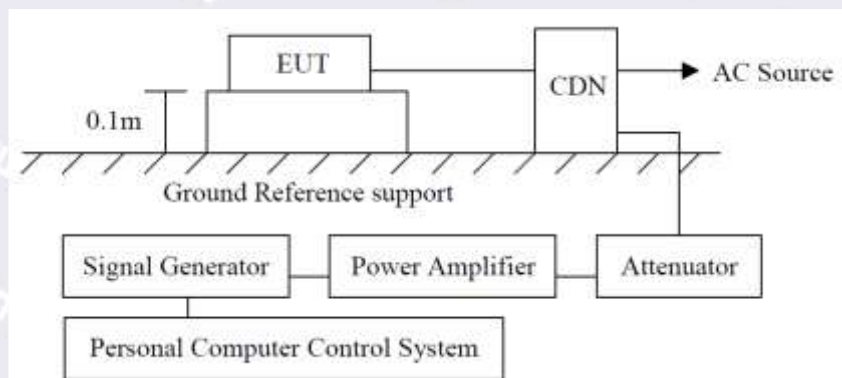
6.6.2 Test Procedure

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;

6.6.3 Test Setup



6.6.4 Test Result

Test Result : N/A
Basic standard : EN 61000-4-6
Product standard : EN 301489-17

6.7 Voltage interruptions voltage Dips

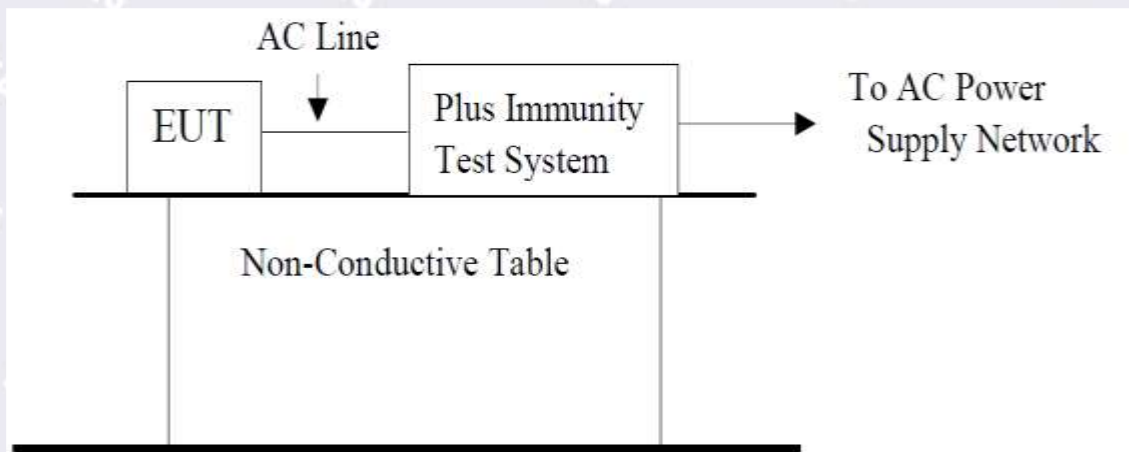
6.7.1 Test Severity level

Voltage dips and Interrupt reduction (%)	Test Duration (period)
>95%	250
30%	25
>95%	0.5
>95%	1

6.7.2 Test Method

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

6.7.3 Test Setup



6.7.4 Test Result

Test Result : N/A
Basic standard : EN 61000-4-11
Product standard : EN 301489-17

Photographs of the Test Setup

Radiated Emission Below 1G



Radiated Emission Above 1G

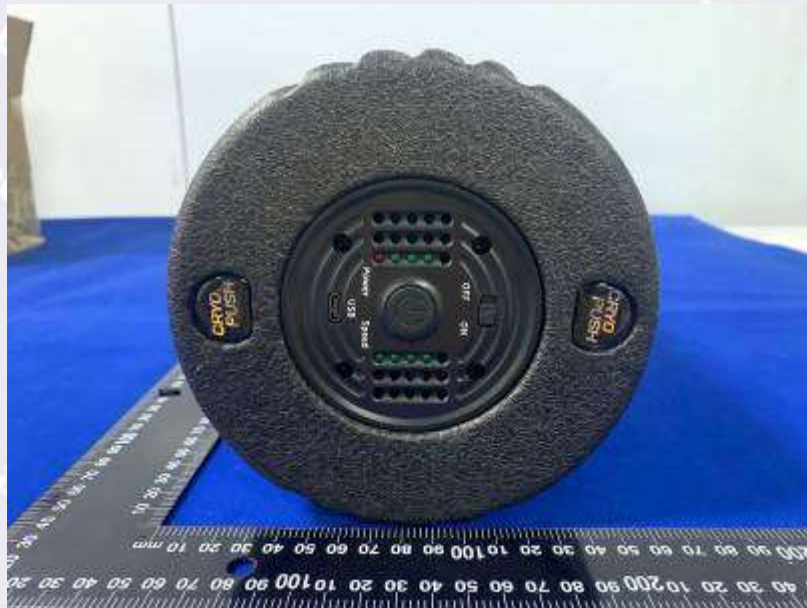


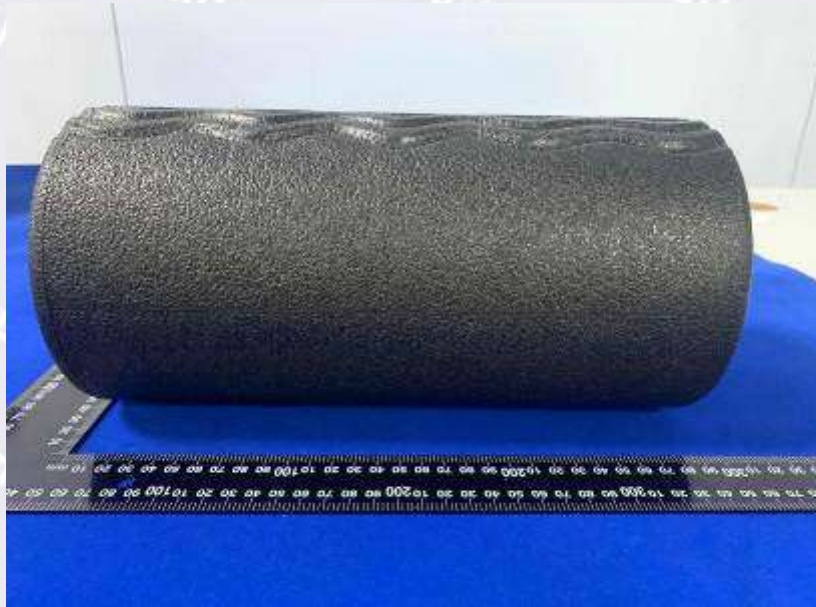
Conducted emission (AC Port)



Photographs of the Test EUT









----END OF REPORT----