EN IEC 55014-1:2021, EN IEC 55014-2:2021
EN IEC 61000-3-2:2019+A1:2021,
EN 61000-3-3:2013+A1:2019

(Council Directive 2014/30/EU - Electromagnetic Compatibility Directive)

EMC MEASUREMENT AND TEST REPORT

FOR

Top Water Flow AS
Stensrudveien 5，2335 Stange NORWAY

MODEL(s): Top Arctic Air M1

2023.08.12

This Report Concerns: ☒ Original Report	**Equipment Type:** Top Arctic Air
Test Engineer: Hu yaohuang	
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Prepared By: Top Water Flow AS Stensrudveien 5，2335 Stange NORWAY	

Test model: Top Arctic Air M1

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The product that is produced by ***Top Water Flow AS***The Applicationmodel(s) or the "EUT" as referred to in this report is a ***AC Motor***

Models: ***Top Arctic Air M1, Top Arctic Air M2,Top Arctic Air M3,Top Arctic Air M4.***

Objective

In order to meet the EMC requirements approved by CENELEC, the following standards will be cited:

1. EN IEC 61000-3-2:2019+A1:2021, EMC-Limits-Limits for the harmonic current emissions (equipment input current up to and including 16 A per phase).

2. EN 61000-3-3:2013+A1:2019 ,EMC-Limits-Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ⩽16 A per phase and not subject to conditional connection.

3. EN IEC 55014-1:2021, Electromagnetic compatibility-Requirements for household appliances, electric tools and similar apparatus – Emission.

4. EN IEC 55014-2:2021, Electromagnetic compatibility-Requirement for household appliances, electric tools and similar apparatus – Immunity – Product family standard.

The following satandares were also be cited in:

EN61000-4-2:2009, EN61000-4-4:2012, EN61000-4-5:2006, EN61000-4-6:2014, EN61000-4-11:2004

Note: The test data is only valid for the test sample. There is possible deviation from the original test data for other product

Equipment Modifications

No modification to the EUT were made by TOP WATER FLOW AS to make sure the EUT complywith applicable limits.

Test model: Top Arctic Air M1

1 -EN IEC 61000-3-2

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
EMC-PARTNER	Harmonics and Flicker Analyzer	HARMONIC S-1000	HAR1000-40	2023.08	3 Year

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

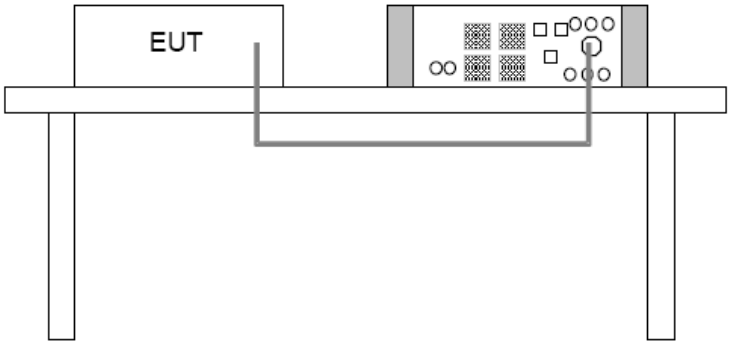
Temperature: 21℃
Humidity: 58% Pressure:
1033mbar
Electromagnetic environment: normal

Test procedure and the test set-up

Procedure

a. 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.
b. The classification of EUT is according to section 5 of EN 61000-3-2. The EUT is classified as follows:
Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
Class B: Portable tools. Arc welding equipment which is not professional equipment
Class C: Lighting equipment, including dimming devices.
Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors.
c. 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 time necessary for the EUT to be exercised.

Set-up



Test model: Top Arctic Air M1

Test Data and Records

Top Arctic Air

Order	Freq. [Hz]	Iavg [A]	Imax [A]	Limit [A]	Status
1	50	1.6895	1.8439		
2	100	0.0122	0.0128	1.0800	
3	150	0.1062	0.1117	2.3000	
4	200	0.0000	0.0018	0.4300	
5	250	0.0244	0.0244	1.1400	
6	300	0.0000	0.0006	0.3000	
7	350	0.0110	0.0116	0.7700	
8	400	0.0000	0.0000	0.2300	
9	450	0.0000	0.0085	0.4000	
10	500	0.0000	0.0000	0.1840	
11	550	0.0000	0.0067	0.3300	
12	600	0.0000	0.0000	0.1533	
13	650	0.0000	0.0049	0.2100	
14	700	0.0000	0.0000	0.1314	
15	750	0.0000	0.0037	0.1500	
16	800	0.0000	0.0000	0.1150	
17	850	0.0000	0.0037	0.1324	
18	900	0.0000	0.0000	0.1022	
19	950	0.0000	0.0037	0.1184	
20	1000	0.0000	0.0000	0.0920	
21	1050	0.0000	0.0024	0.1071	
22	1100	0.0000	0.0000	0.0836	
23	1150	0.0000	0.0018	0.0978	
24	1200	0.0000	0.0000	0.0767	
25	1250	0.0000	0.0018	0.0900	
26	1300	0.0000	0.0000	0.0708	
27	1350	0.0000	0.0018	0.0833	
28	1400	0.0000	0.0000	0.0657	
29	1450	0.0000	0.0018	0.0776	
30	1500	0.0000	0.0000	0.0613	
31	1550	0.0000	0.0012	0.0726	
32	1600	0.0000	0.0000	0.0575	
33	1650	0.0000	0.0012	0.0682	
34	1700	0.0000	0.0000	0.0541	
35	1750	0.0000	0.0012	0.0643	
36	1800	0.0000	0.0000	0.0511	
37	1850	0.0000	0.0012	0.0608	
38	1900	0.0000	0.0000	0.0484	
39	1950	0.0000	0.0006	0.0577	
40	2000	0.0000	0.0000	0.0460	

Result: PASSED

Verdict

The EUT met the requirement.

Test model: Top Arctic Air M1

2 -EN61000-3-3

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
EMC-PARTNER	Harmonics and Flicker Analyzer	HARMONIC S-1000	HAR1000-40	2023.09	3 Year

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

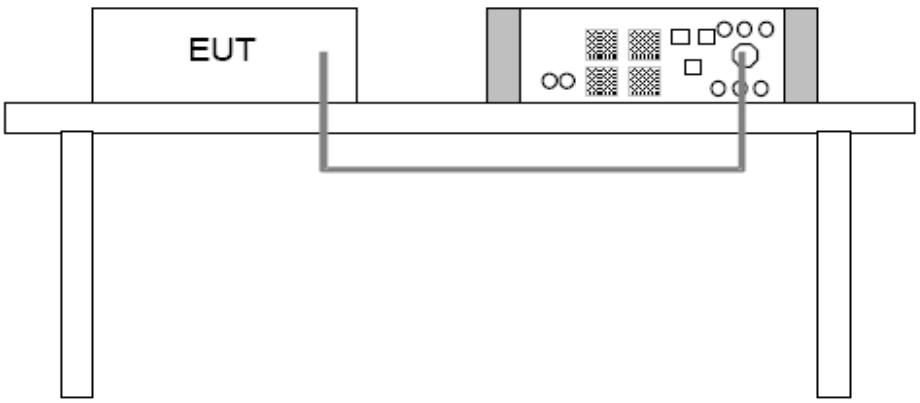
Temperature: 21℃
Humidity: 58% Pressure:
1033mbar
Electromagnetic environment: normal

Test procedure and the test set-up

Procedure

a. 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 operating conditions.
b. During the flick measurement, the measure time shall include that part of whole operation cycle in which the EUT produce the most unfavorable sequence of voltage changes. The observation period for short-term flicker indicator is 10 minutes and the observation period for long-term flicker indicator is 2 hours.

Set-up



Test model: Top Arctic Air M1

Test Data and Records

Plt = 0. 072

	Pst	dmax	dc	dt>Lim
1	0.072	0.000	0.120	0.000
2	0.073	0.410	0.230	0.000
3	0.072	0.470	0.290	0.000
4	0.072	0.000	0.210	0.000
5	0.073	0.000	0.190	0.000
6	0.072	0.430	0.270	0.000
7	0.072	0.000	0.150	0.000
8	0.072	0.440	0.390	0.000
9	0.072	0.000	0.160	0.000
10	0.072	0.400	0.180	0.000
11	0.072	0.000	0.000	0.000
12	0.072	0.410	0.420	0.000

Result: PASSED

Verdict

The EUT met the requirement.

3 -EN IEC 55014-1

Continuous Disturbance Voltage at Mains Terminal.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
Albatross Projects GmbH	Shield Room	Site 1	---	2023.08	2 Year
R&S	EMI Test Receiver	ESU40	1302	2023.08	1 Year
R&S	Artificial Mains（Two Line）	ENV216	3560	2023.09	2 Year
R&S	EMI Test System Cabinet	---	---	N/A	N/A
R&S	EMI Test Software	EMC32	---	N/A	N/A

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

Temperature: 21℃
Humidity: 58% Pressure:
1033mbar
Electromagnetic environment: normal

Limits of Continuous Disturbance Voltage at Mains Terminal.

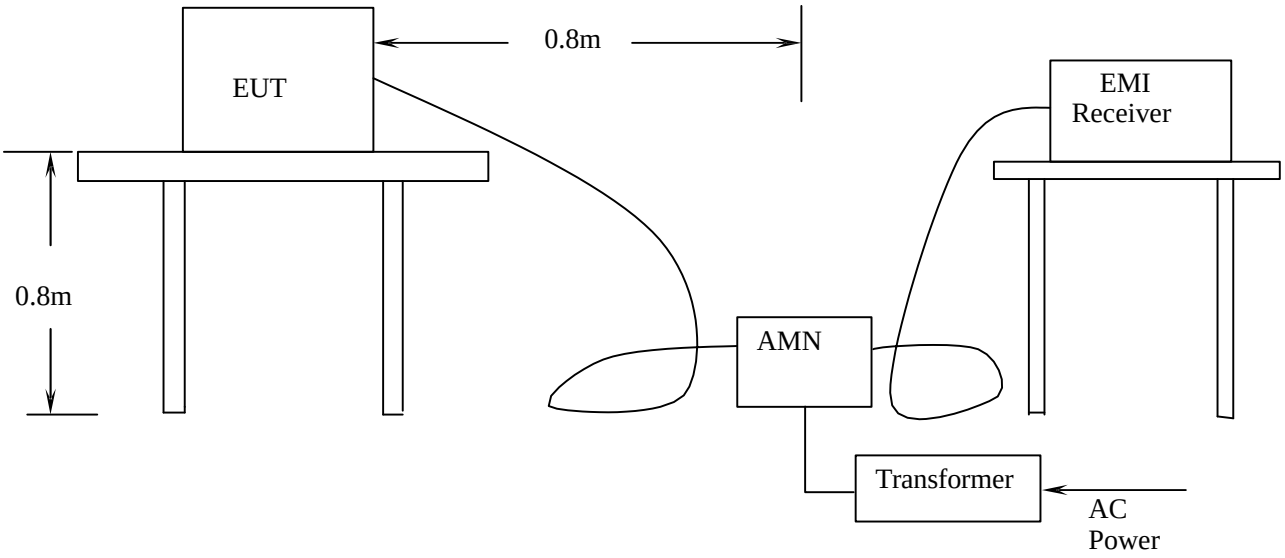
Equipment type	Frequency range MHz	Limit values dBμV	
		Quasi-peak	Average
Household appliance	0.15 to 0.50	66-56 [a]	59 to 46 [a]
	0.50 to 5	56	46
	5 to 30	60	50
[a] Decreasing linearly with logarithm of the frequency.			

Note: If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

Test model: Top Arctic Air M1

Configuration

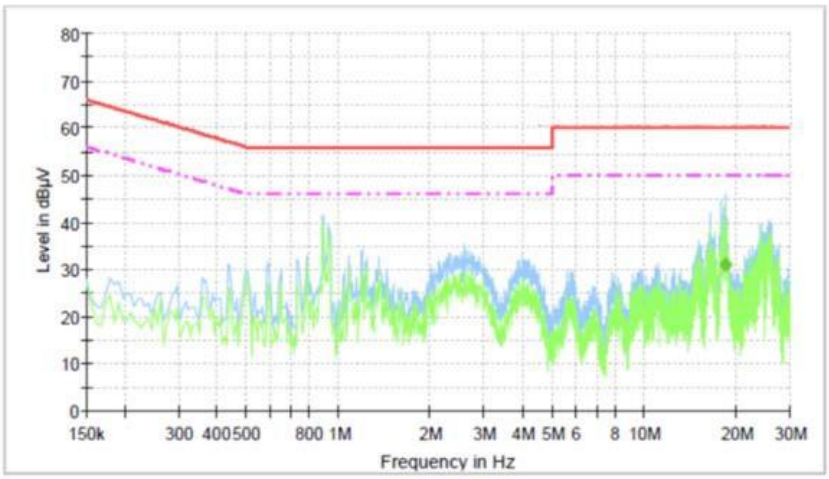
The configuration is in accordance with the requirement in EN55014-1, the sketch map as follow:



Test Data and Records

PASSED

L& N:



Test model: Top Arctic Air M1

Disturbance Voltage at the Mains Terminal TEST DATA			
Frequency	Amplitude	Detector	Limit
MHz	dBμV	QP/Ave/Peak	dBμV
0.15-0.5	*	QP	66-56 Decreasing linearly with logarithm of the frequency
0.50-5	*	QP	56
5-30	*	QP	60
* Means the continuous disturbance voltage level 6 dB lower than limits.			

Verdict

The EUT met the requirement.

Test model: Top Arctic Air M1

3.2.1 Disturbance Power

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
R&S	Absorbing Clamp	MDS-21	0194	2023.08	2 Year
R&S	EMI Test Receiver	ESU40	1302	2023.08	1 Year
R&S	EMI Test System Cabinet	---	---	N/A	N/A
Albatross Projects GmbH	Shield Room	Site 1	---	2023.09	2 Year
R&S	EMI Test Software	EMC32	---	N/A	N/A

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

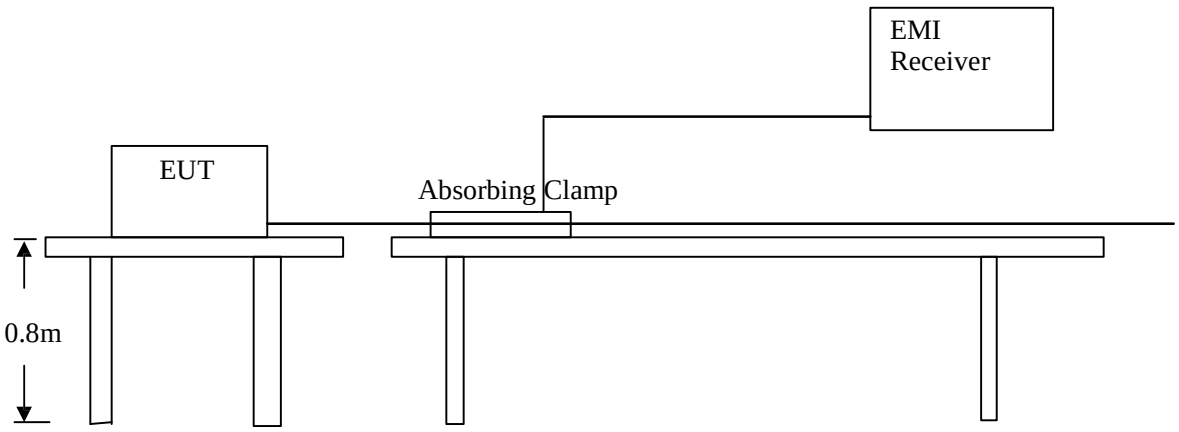
Temperature: 21℃
Humidity: 56% Pressure:
1033mbar
Electromagnetic environment: normal

3.3.3 Limits of Disturbance Power

Equipment type	Frequency range MHz	Limit values (dBpW)	
		Quasi-peak	Average
Household appliance	30 to 300	45 to 55[a]	35 to 45[a]
[a] Increasing linearly with frequency.			

Configuration

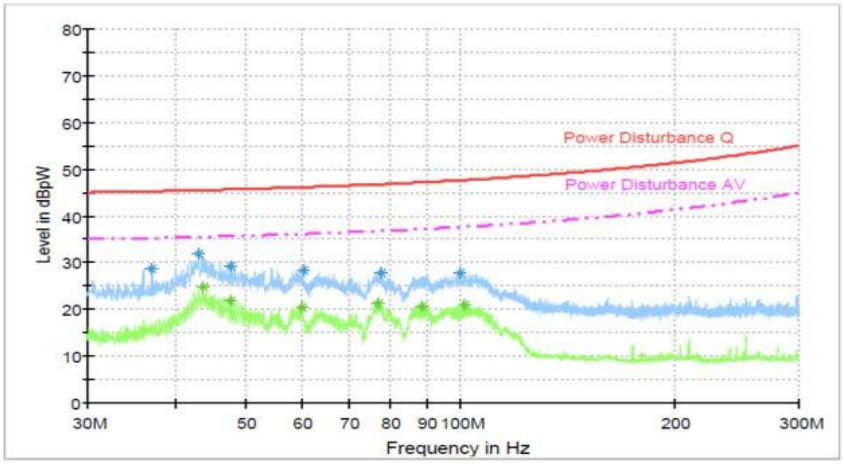
The configuration in accordance with the requirement in EN55014-1, the sketch map as follow:



Test model: Top Arctic Air M1

Test Data and Records

Passed



Disturbance Voltage at the Mains Terminal TEST DATA			
Frequency	Amplitude	Detector	Limit
MHz	dBμV	QP/Ave/Peak	dBμV
30 to 300	*	QP	45-55 Decreasing linearly with logarithm of the frequency

* Means the continuous disturbance voltage level 6 dB lower than limits.

Verdict

The EUT met the requirement.

Test model: Top Arctic Air M1

Radiated disturbances

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
Albatross Projects GmbH	Semi-Anechoic Chamber	---	9290832	2023.09	2 Year
R&S	Ultra-broadband Antennas	HL562	---	2023.08	2 Year
Inn-co GmbH	Antenna Towers	---	---	N/A	N/A
R&S	EMI Test Receiver	ESU40	1302	2023.08	1 Year
Inn-co GmbH	Turntable	DS2000S-1t		N/A	N/A
Inn-co GmbH	Controller	CO 2000	10806L	N/A	N/A
R&S	EMI Test Software	EMC32	---	N/A	N/A
R&S	EMI Test System Cabinet	---	---	N/A	N/A

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Test Procedure

The EUT was placed on a turn table. The turn table can rotate 360 degrees to determine the position of the maximum emission level. EUT was set 3 meter (Semi-Anechoic Chamber) away from the receiving antenna which was mounted on a antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antenna (calibrated biconical and log periodical antenna) were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement.

The bandwidth of the R&S EMI Receiver ESU40 was set at 120 kHz.

The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector.

The all final readings from test receiver were measured with Quasi-Peak detector.

Radiated Emission Limit

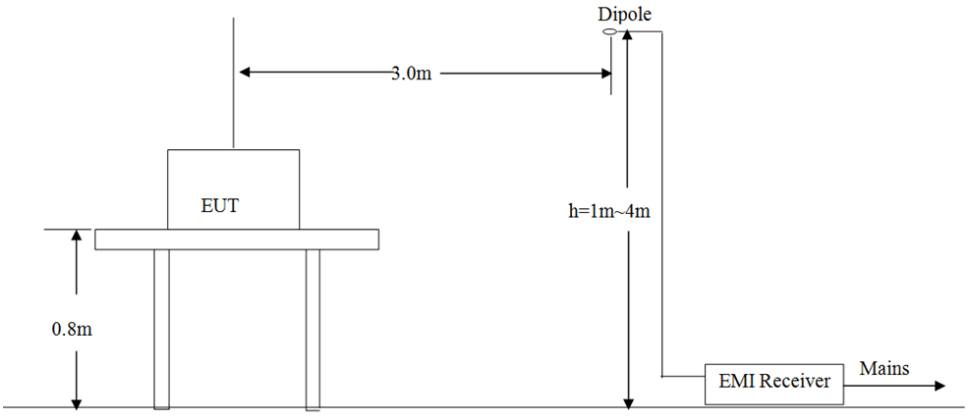
FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTHS LIMITS (dBu V/m)
30-230	10(3)	30(40)
230-1000	10(3)	37(47)

Note: (1) The lower limit shall apply at the transition frequency.
(2) ( ) is 3 meters limit.

Test model: Top Arctic Air M1

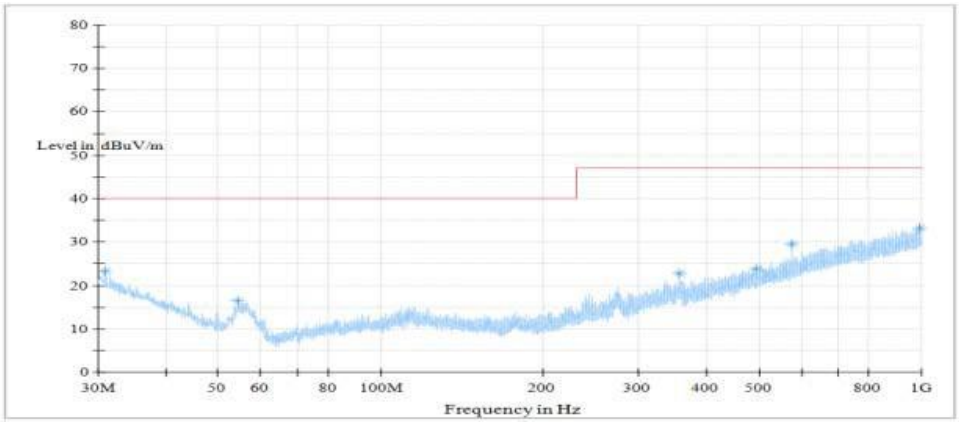
Configuration

The configuration is in accordance with the requirement in EN55014, the sketch map as follow:



Test Data and Records

Passed



Horizontal

Disturbance Voltage at the Mains Terminal TEST DATA			
Frequency	Amplitude	Detector	Limit
MHz	dBμV	QP/Ave/Peak	dBμV
30 to 230	*	**QP**	40
230 to 1000	*	**QP**	47
* Means the continuous disturbance voltage level 6 dB lower than limits.			

Verdict

The EUT met the requirement.

Test model: Top Arctic Air M1

Discontinuous Disturbance Voltage at Mains Terminal (Click)

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
Albatross Projects GmbH	Shield Room	Site 1	---	2023.08	2 Year
AFJ	Click Meter	CL55C	5040019044	2023.08	1 Year
AFJ	Artificial Mains (Two Line)	LS16C	16010020077	2022.02	2 Year

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

Temperature: 22℃
Humidity: 56% Pressure:
1033mbar
Electromagnetic environment: normal

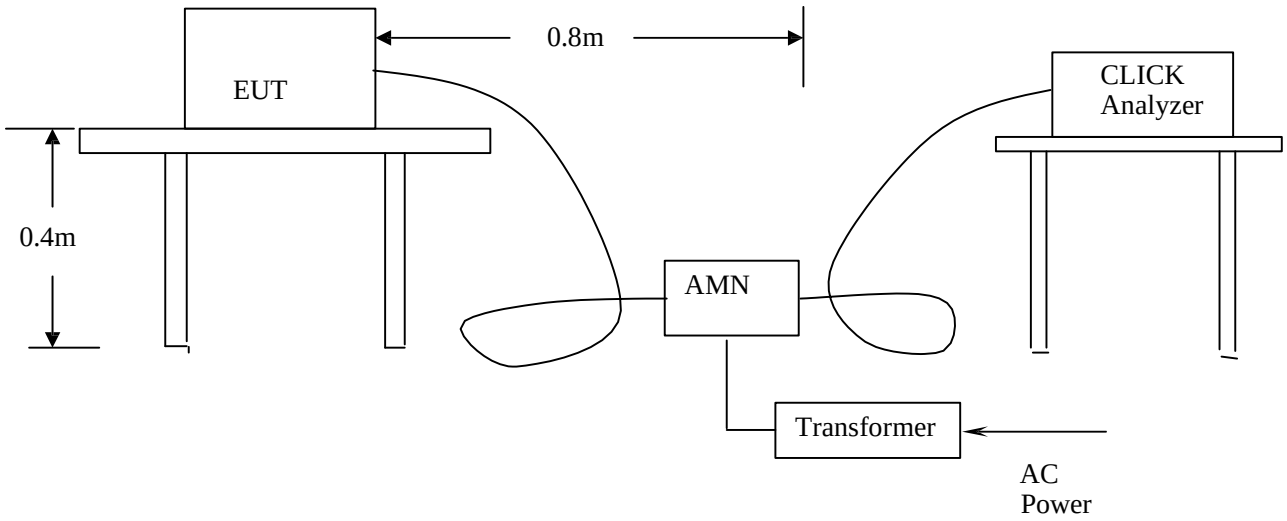
Limits of Click

For discontinuous disturbance, the click limit is attained by increasing the relevant limit of Continuous Disturbance Voltage with:

44dB for $N < 0.2$ or
20lg(30/N) dB for $0.2 \leq N < 30$

Configuration

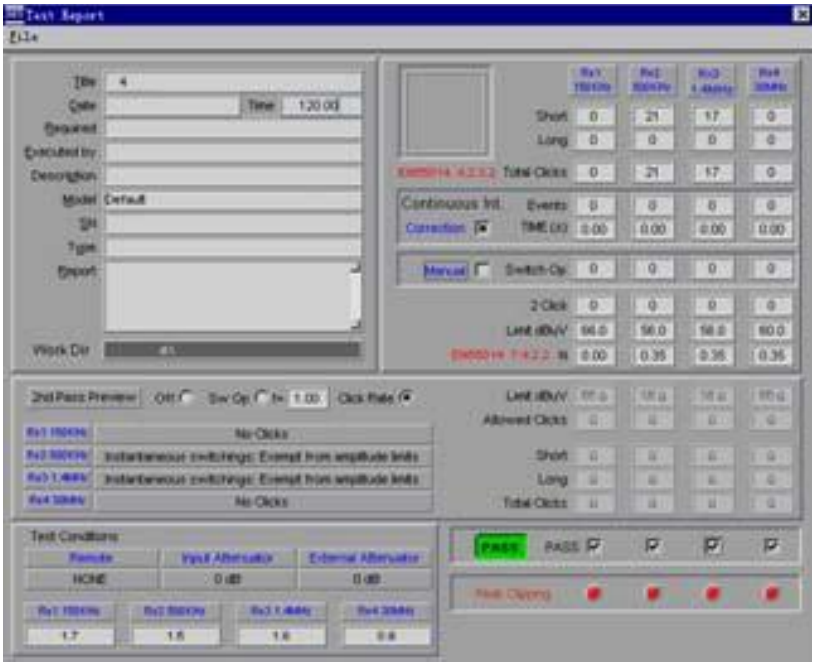
The configuration in accordance with the requirement in EN55014-1, the sketch map as follow:



Test model: Top Arctic Air M1

Test Data and Records

Click Photograhp



Verdict

The EUT met the requirement.

4 -EN IEC 55014-2

Description of Performance Criterion (According with EN55014-2 Section 6)

Performance Criterion A

The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacture, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance Criterion B

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however, no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacture, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.

Performance Criterion C

Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

Test model: Top Arctic Air M1

SURGES

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
Noise Laboratory CO., LTD	Surge Lite	LSS-6030	9099E00350	2023.08	2 Year

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

Temperature: 21℃
Humidity: 58% Pressure:
1033mbar
Electromagnetic environment: normal

Test procedure and the test set-up

Procedure

a. For EUT power supply:

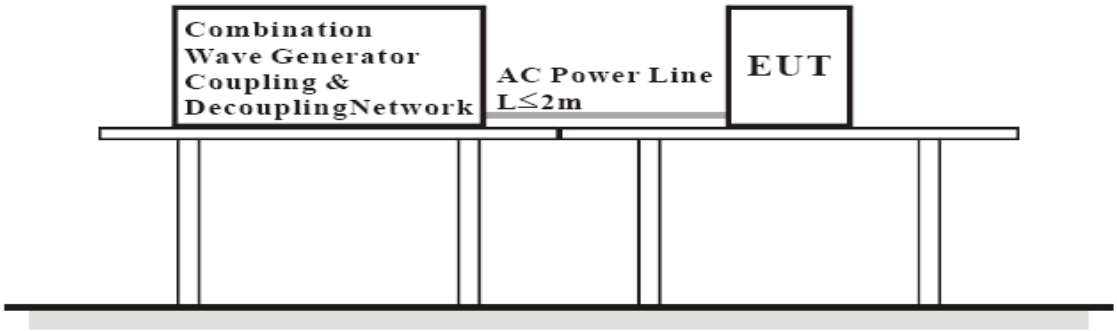
The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT: The surge is applied to the lines via the capacitive coupling. The coupling / decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT: The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

Test model: Top Arctic Air M1

Set-up



Test Data and Records

Terminal	Voltage KV	Path	Phase	Number Of Impulses	Pass	Fail
MAINS	±1	L-N	0 °	5	B	
MAINS	±1	L-N	90 °	5	B	
MAINS	±1	L-N	180 °	5	B	
MAINS	±1	L-N	270 °	5	B	

Verdict

The EUT was working as normal, so they met the requirement of performance criteria B.

Test model: Top Arctic Air M1

ESD

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
Shanghai Sanki	Electrostatic Discharge tester	ESD-320	0329501C	2023.09	2 Year

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

Temperature: 21℃
Humidity: 58% Pressure:
1033mbar
Electromagnetic environment: normal

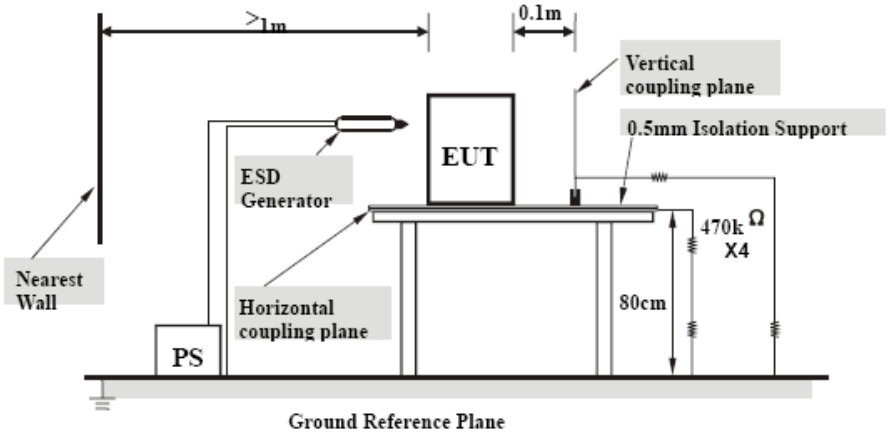
Test procedure and the test set-up

Procedure

a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
c. The time interval between two successive single discharges was at least 1 second.
d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
g. At least ten single discharges (in the most sensitive polarity) were applied at the front edge of each Horizontal Coupling Plane opposite the center point of each unit of the EUT and 0.1 meters from the front of the EUT. The long axis of the discharge electrode was in the plane of the HCP and perpendicular to its front edge during the discharge.
h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the Vertical Coupling Plane in sufficiently different positions that the four faces of the EUT were completely illuminated. The VCP (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

Test model: Top Arctic Air M1

Set-up



Test Data and Records

Air Discharge

Test Levels																
EN61000-4-2 Test Points	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	-10 kV	+10 kV	-12.5 kV	+12.5 kV	-15 kV	+15 kV	-20 kV	+20 kV
EUT Front Side	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**								
EUT Top Side	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**								
EUT Back Side	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**								
EUT Left Side	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**								
EUT Right Side	**B**	**B**	**B**	**B**	**B**	**B**	**B**	**B**								

Direct Contact

Test Levels																
EN61000-4-2 Test Points	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	-10 kV	+10 kV	-12.5 kV	+12.5 kV	-15 kV	+15 kV	-20 kV	+20 kV
EUT Front	**B**	**B**	**B**	**B**												
EUT Top Side	**B**	**B**	**B**	**B**												
EUT Back Side	**B**	**B**	**B**	**B**												
EUT Left Side	**B**	**B**	**B**	**B**												
EUT Right Side	**B**	**B**	**B**	**B**												

Verdict

The EUT was working as normal, so they met the requirement of performance criteria B.

Test model: Top Arctic Air M1

EFT/B

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
Shanghai Sanki	E.F.TB Generator	8014	069504E	2023.08	2 Year

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

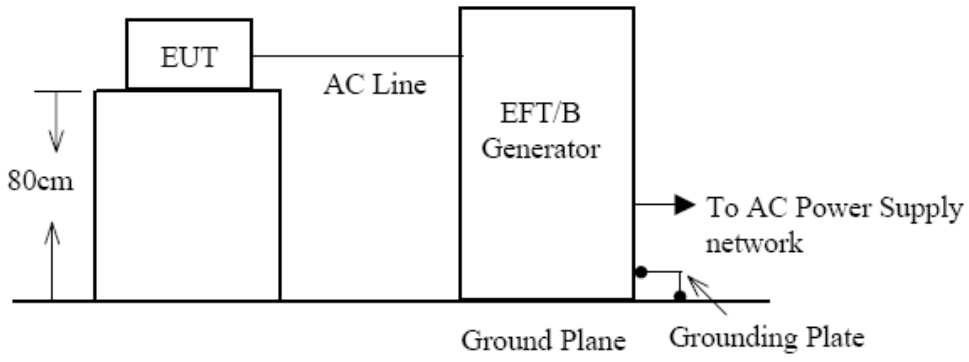
Temperature: 21℃
Humidity: 58% Pressure:
1033mbar
Electromagnetic environment: normal

Test procedure and the test set-up

Procedure

a. Both positive and negative polarity discharges were applied.
b. The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT should not exceed 1 meter.
c. The duration time of each test sequential was 1 minute.
d. The transient/burst waveform was in accordance with IEC 61000-4-4, 5/50ns.

Set-up



Test model: Top Arctic Air M1

Test Data and Records

The EUT was tested that it worked at the normal state.

Test Levels (kV)									
EN61000-4-4 Test Points		+0.25	-0.25	+0.5	-0.5	+1.0	-1.0	+2.0	-2.0
Power Port of EUT	L	B	B	B	B	B	B		
	N	B	B	B	B	B	B		
	L+ N	B	B	B	B	B	B		
	L+ N+PE	B	B	B	B	B	B		

Verdict

The EUT was working as normal, so it met the requirement of performance criteria B.

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Test model: Top Arctic Air M1

INJECTED CURRENTS

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
Giga-tronics	Synthesized RF Signal Generator	6061A	5130304	2022.02	2 Year
QF	Broadband Power Amplifier	QF3860	---	2023.09	2 Year
QF	Millivoltmeter	QF2281	92028	2023.08	2 Year

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations have been performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

Temperature: 22℃
Humidity: 59% Pressure:
1033mbar
Electromagnetic environment: normal

Configuration

The configuration in accordance with the requirement in EN61000-4-6, see the photo in appendix.

Test Data and Records

EN61000-4-6 Test Points	Frequency range MHz	Levels	Voltage Level (e.m.f.)V	Pass	Fail
Power Line	0.15-230MHz	1	1		
		2	3	A	
		3 X	10 Special		

Verdict

The apparatus continue to operate as intended during the test. No degradation of performance or loss of function. It is belong to Performance Criterion A so they met the requirement.

Test model: Top Arctic Air M1

VOLTAGE DIPS AND INTERRUPTIONS

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
Noise Laboratory CO., LTD	Voltage Dip Simulator	VDS-220B	2199D00098	2023.09	2 Year

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations havebeen performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

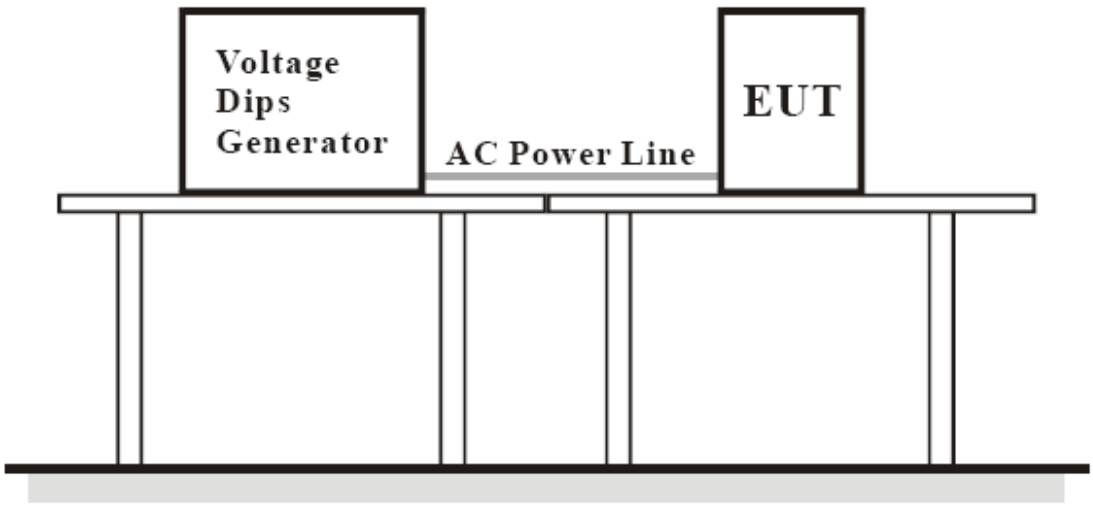
Temperature: 21℃
Humidity: 58% Pressure:
1033mbar
Electromagnetic environment: normal

Test procedure and the test set-up

Procedure

The EUT shall be tested for each selected combination of test levels and duration with a sequence of tree dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

Set-up



Test model: Top Arctic Air M1

Test Data and Records

Environmental phenomena		Test level in % U_T	Duration (in periods of the rated frequency)	Phase Angle	Pass	Fail
Interruptions		0	0.5T	0/180	**C**	
Voltage dips in % U_T	60	40	10T	0/180	**C**	
	30	70	50T	0/180	**C**	

Verdict

The EUT was working as normal, so they met the requirement of performance criteria C.

Test model: Top Arctic Air M1

Radio-frequency electromagnetic field

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Last Cal. Date	Cal. Period
R&S	Signal Generator	SMR-40	1104	2023.08	1 Year
QF	Broadband Power Amplifier	QF3860	---	2023.08	2 Year
QF	Millivoltmeter	QF2281	92028	2023.08	2 Year
Albatross Projects GmbH	Anechoic Chamber	---	9290832	2023.08	2 Year
R&S	Ultra-broadband Antennas	HL562	---	2023.08	2 Year
Inn-co GmbH	Antenna Towers	---	---	N/A	N/A
Inn-co GmbH	Turntable	DS2000S-1t	---	N/A	N/A
Inn-co GmbH	Controller	CO 2000	10806L	N/A	N/A

***Statement of Traceability: TOP WATER FLOW AS** certifies that all calibrations havebeen performed using suitable standards traceable to the CHINA SCEIENTIFIC MEASUREMENT INSTITUTE.

Description of Measurement Conditions

Temperature: 20℃
Humidity: 60% Pressure:
1033mbar
Electromagnetic environment: normal

Test procedure and the test set-up

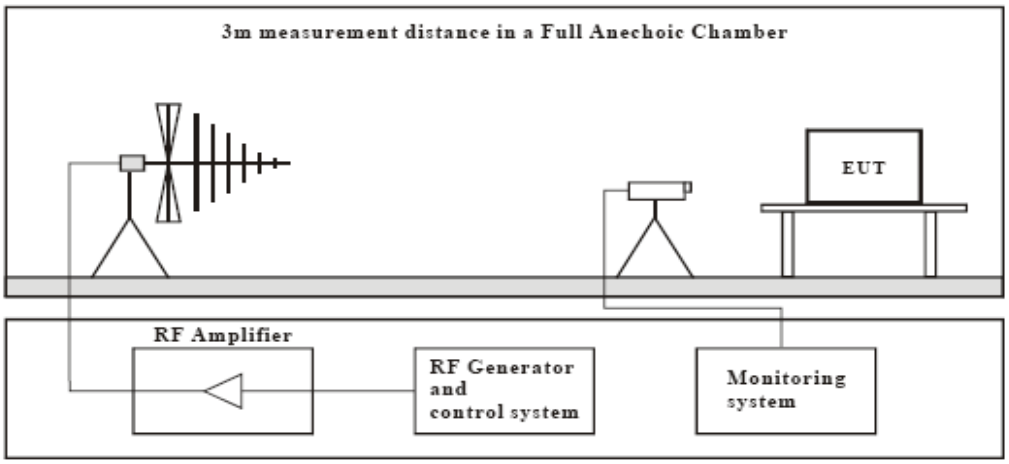
Procedure

The test procedure was in accordance with EN 61000-4-3

a. The testing was performed in a fully-anechoic chamber. The transmit antenna was located at a distance of 3 meters from the EUT.
b. The frequency range is swept from 80 MHz to 1000 MHz with the signal 80% amplitude modulated with a 1kHz sinewave. The rate of sweep did not exceed 1.5 x 10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1 % of preceding frequency value.
c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
d. The field strength level was 3V/m.
e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

Test model: Top Arctic Air M1

Set-up



Test Data and Records

Frequency Range (MHz)	Front Side (3 V/m)		Rear Side (3 V/m)		Left Side (3 V/m)		Right Side (3 V/m)	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-1000	A	A	A	A	A	A	A	A

Verdict

The EUT was working as normal, so it met the requirement of performance criteria A.

Test model: Top Arctic Air M1

APPENDIX A — PHOTOGRAPHS