

SINOWELL (SHANGHAI) CO., LTD.

CE-EMC TEST REPORT

Prepared For:	SINOWELL (SHANGHAI) CO., LTD. 96 Siping Road Financial Street Hailun Centre Tower A Room 3603-3604 Shanghai, PRC 200086
Product Name:	DUCT BOOSTER FAN
Trade Name:	N/A
Model:	ZTF-250, ZTF-100, ZTF-150, ZTF-200, DUCT BOOSTER FAN 100MM, DUCT BOOSTER FAN 150MM, DUCT BOOSTER FAN 200MM, DUCT BOOSTER FAN 250MM, IN FAN 4, IN FAN 6, IN FAN 8, IN FAN 10, 331101-4, 331101-6, 331101-8, 331101-10
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TEST REPORT DECLARATION

Applicant	:	SINOWELL (SHANGHAI) CO., LTD.
Address	:	96 Siping Road Financial Street Hailun Centre Tower A Room 3603-3604 Shanghai, PRC 200086
Manufacturer	:	SINOWELL (SHANGHAI) CO., LTD.
Address	:	96 Siping Road Financial Street Hailun Centre Tower A Room 3603-3604 Shanghai, PRC 200086
EUT Description	:	DUCT BOOSTER FAN
Model Number	:	ZTF-250, ZTF-100, ZTF-150, ZTF-200, DUCT BOOSTER FAN 100MM, DUCT BOOSTER FAN 150MM, DUCT BOOSTER FAN 200MM, DUCT BOOSTER FAN 250MM, IN FAN 4, IN FAN 6, IN FAN 8, IN FAN 10, 331101-4, 331101-6, 331101-8, 331101-10

Test Standards:

EN55014-1:2017
EN55014-2:2015
EN61000-3-2:2014, EN61000-3-3:2013

The EUT described above is tested by United Testing Technology (Hong Kong) Limited EMC Laboratory to determine the maximum emissions from the EUT and ensure the EUT to be compliance with the immunity requirements of the EUT. United Testing Technology (Hong Kong) Limited EMC Laboratory is assumed full responsibility for the accuracy of the test results. Also, this report shows that the EUT technically complies with the 2014/30/EU directive and its amendment requirements.

The test report is valid for above tested sample only and shall not be reproduced in part without written approval of the laboratory.

Prepared by:

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Reviewer:

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Approved & Authorized Signer:

Liuze
Liuze/Manager

TEST SUMMARY

Test procedures according to the technical standards:

EMC Emission				
Standard	Test Item	Limit	Judgment	Remark
EN55014-1: 2017	Conducted Emission	Class B	PASS	
	Disturbance Power	Class B	PASS	
EN61000-3-2: 2014	Harmonic Current Emission	Class A or D NOTE (2)	PASS	
EN61000-3-3: 2013	Voltage Fluctuations & Flicker	-----	PASS	
EMC Immunity				
Section EN55014-2: 2015	Test Item	Performance Criteria	Judgment	Remark
EN61000-4-2: 2009	Electrostatic Discharge	B	PASS	
EN61000-4-3: 2006+A2: 2010	RF electromagnetic field	A	PASS	
EN61000-4-4: 2012	Fast transients	B	PASS	
EN61000-4-5: 2014	Surges	B	PASS	
EN61000-4-6: 2014+AC: 2015	Injected Current	A	PASS	
EN61000-4-11: 2004	Volt. Interruptions Volt. Dips	B / B / C NOTE (3)	PASS	

NOTE:

(1)' N/A' denotes test is not applicable in this Test Report

(2) Voltage dip: 0% reduction – Performance Criteria **B**

Voltage dip: 30% reduction – Performance Criteria **B**

Voltage dip: 60% reduction – Performance Criteria **C**

(3) For client's request and manual description, the test will not be executed.

TEST FACILITY

Shenzhen United Testing Technology Co., Ltd.

Add. : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %.

Test	Parameters	Expanded Uncertainty (U_{Lab})	Expanded Uncertainty (U_{Cispr})
Conducted Emission	Level Accuracy: 9kHz~150kHz 150kHz to 30MHz	± 3.42 dB ± 3.42 dB	± 4.0 dB ± 3.6 dB
Radiated Emission	Level Accuracy: 9kHz to 30 MHz	± 4.60 dB	N/A
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	± 4.40 dB	± 5.2 dB
Radiated Emission	Level Accuracy: Above 1000MHz	± 4.20 dB	N/A
Mains Harmonic	Voltage	$\pm 3.11\%$	N/A
Voltage Fluctuations & Flicker	Voltage	$\pm 3.25\%$	N/A

1. GENERAL INFORMATION

1.1. GENERAL DESCRIPTION OF EUT

Equipment	DUCT BOOSTER FAN					
Model Name	ZTF-250					
Serial No	ZTF-100, ZTF-150, ZTF-200, DUCT BOOSTER FAN 100MM, DUCT BOOSTER FAN 150MM, DUCT BOOSTER FAN 200MM, DUCT BOOSTER FAN 250MM, IN FAN 4, IN FAN 6, IN FAN 8, IN FAN 10, 331101-4, 331101-6, 331101-8, 331101-10					
Model Difference	Only Model Number.					
Class of EUT	<input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B					
Product Description	<p>The EUT is a DUCT BOOSTER FAN.</p> <table border="1"> <tr> <td>Operating frequency:</td><td>N/A</td></tr> <tr> <td>Connecting I/O port:</td><td>N/A</td></tr> </table>		Operating frequency:	N/A	Connecting I/O port:	N/A
Operating frequency:	N/A					
Connecting I/O port:	N/A					
Power Supply	220-240V,50Hz					

1.2. DESCRIPTION OF TEST MODES

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	Running

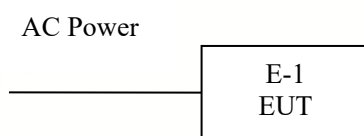
For Conducted Test	
Final Test Mode	Description
Mode 1	Running

For Radiated Test	
Final Test Mode	Description
Mode 1	Running

For EMS Test	
Final Test Mode	Description
Mode 1	Running

1.3. DESCRIPTION OF TEST SETUP

Mode 1:



1.4. DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	DUCT BOOSTER FAN	N/A	ZTF-250	ZTF-100, ZTF-150, ZTF-200, DUCT BOOSTER FAN 100MM, DUCT BOOSTER FAN 150MM, DUCT BOOSTER FAN 200MM, DUCT BOOSTER FAN 250MM, IN FAN 4, IN FAN 6, IN FAN 8, IN FAN 10, 331101-4, 331101-6, 331101-8, 331101-10	EUT

Item	Shielded Type	Ferrite Core	Length	Note

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.
- (3) ‘YES’ means ‘shielded’ ‘with core’; ‘NO’ means ‘unshielded’ ‘without core’.

1.5. MEASUREMENT INSTRUMENTS LIST

Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	AMN	SCHWARZBECK	NNLK8121	8121370	2019.9.9
2	AMN	ETS	3810/2	00020199	2019.9.9
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	101210	2019.9.9
4	AAN	TESEQ	T8-Cat6	38888	2019.9.9

Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Horn Antenna	Sunol	DRH-118	A101415	2019.9.29
2	Broadband Hybrid Antenna	Sunol	JB1 Antenna	A090215	2019.9.29
3	Amplifier	HP	8449B	3008A00160	2019.9.9
4	Amplifier	HP	8447D	2944A07999	2019.9.9
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESR3	101891	2019.9.9
6	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2019.9.9
7	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2019.9.8
8	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2019.9.8
9	Broadband Hybrid Antenna	Schwarzbeck	VULB9163	VULB9163#958	2019.9.8
10	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.1.12
11	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2019.11.02
12	Loop Antenna	Beijing daze Technology	ZN30401	13015	2019.9.9
13	EM CAMLP	SCHWARZBECK	MDS21	03350	2019.9.12
14	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2019.03.14
15	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2019.10.24

Harmonic / Flicker Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Power Analyzer	California Instrumnets	PACS-1	X71719	2019.9.28
2	AC Power Source	California Instrumnets	5001ix	HK53570	2019.9.9

Electrostatic Discharge Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
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1	ESD Simulator	EM TEST	ESD30C/P30	1202-17	2019.9.9
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Surge Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Surge Generator	Shanghai Lioncel	LSG-506S	LSG506S0160601	2019.9.7
2	CDN	Shanghai Lioncel	CDN-532S	CDN532S0160601	2019.9.7

Electrical Fast Transient/Burst Immunity Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	EFT/B Generator	Shanghai Lioncel	EFT-404S	EFT404S0160601	2019.9.7

Power-frequency magnetic fields Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Magnetic Field Test System	Shanghai Lioncel	PMF801C-T	PMF801C-T	2019.9.9

Voltage dips and interruptions Test

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	AC Power Source	California Instrumnets	5001ix	HK53570	2019.9.9

2. EMC EMISSION TEST

2.1. CONDUCTED EMISSION MEASUREMENT

POWER LINE CONDUCTED EMISSION

(Frequency Range 150KHz-30MHz)

Frequency Range (MHz)	At mains terminals		At load terminals and additional terminals	
	Quasi-peak (dBuV)	Average (dBuV)	Quasi-peak (dBuV)	Average (dBuV)
0.15 -0.5	66 - 56 *	56 - 46 *	80.00	70.00
0.50 -5.0	56.00	46.00	74.00	64.00
5.0 -30.0	60.00	50.00	74.00	64.00

MAINS TERMINALS OF TOOLS

Frequency Range (MHz)	Rated motor power not exceeding 700W		Rated motor power above 700W and not exceeding 1 000 W		Rated motor power above 1 000 W	
	dB (uV) Quasi-peak	dB (uV) Average**	dB (uV) Quasi-peak	dB (uV) Average**	dB (uV) Quasi-peak	dB (uV) Average**
0.15 -0.5	66.0 to 59.0*	59.0 to 49.0*	70.0 to 63.0*	63.0 to 53.0*	76.0 to 69.0*	69.0 to 59.0*
0.50 -5.0	59.0	49.0	63.0	53.0	69.0	59.0
5.0 -30.0	64.0	54.0	68.0	58.0	74.0	64.0

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of ' * ' marked band means the limitation decreases linearly with the logarithm of the frequency in the range.
- (3) '**' 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.

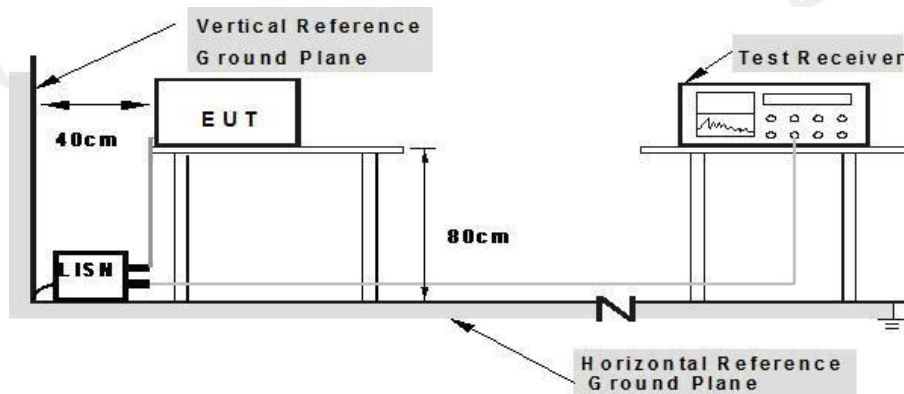
The following table is the setting of the receiver

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

TEST PROCEDURE

- The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

TEST SETUP



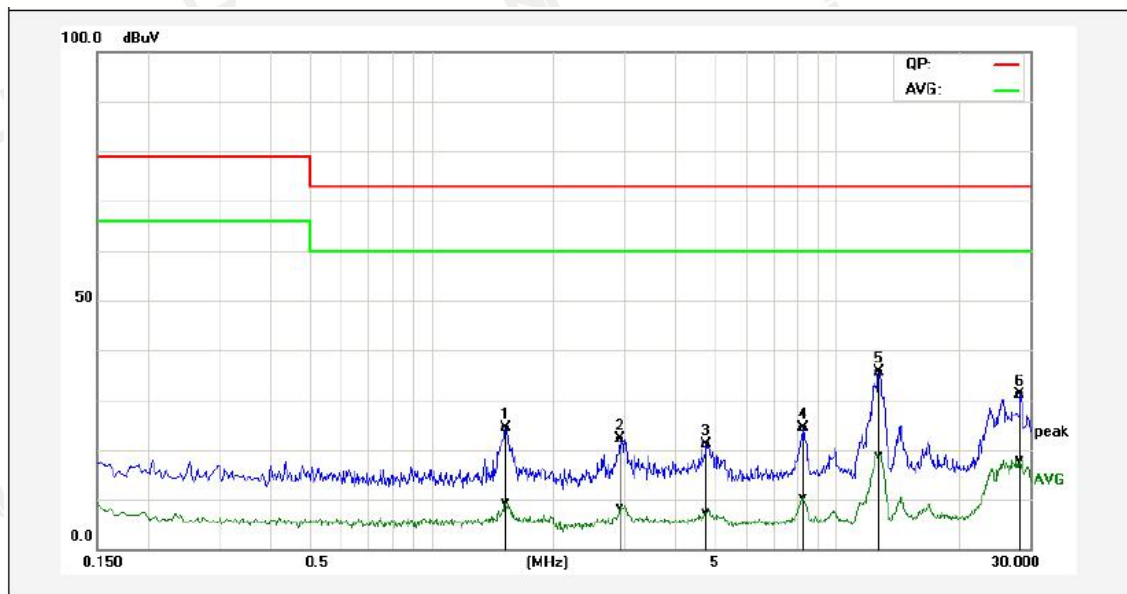
Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

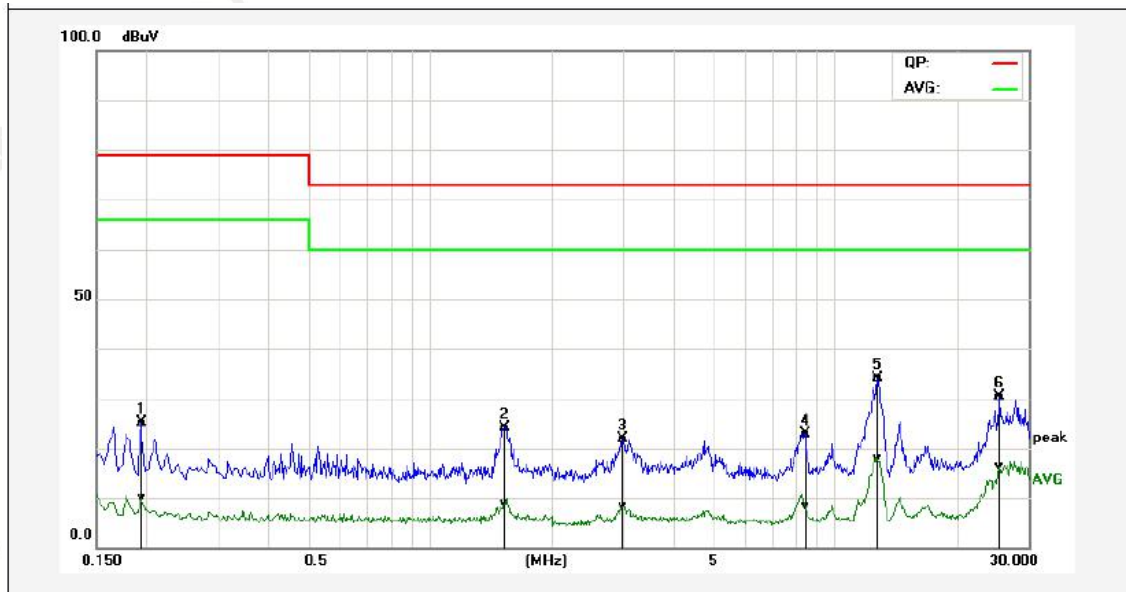
TEST RESULTS

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running	Phase:	L
Test Voltage:	AC 230V, 50/60Hz		



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1P	1.5339	14.41	-0.54	9.87	24.28	9.33	73.00	60.00	-48.72	-50.67	Pass
2P	2.9300	12.19	-1.61	9.93	22.12	8.32	73.00	60.00	-50.88	-51.68	Pass
3P	4.7940	11.10	-2.70	9.98	21.08	7.28	73.00	60.00	-51.92	-52.72	Pass
4P	8.3100	14.46	0.37	9.90	24.36	10.27	73.00	60.00	-48.64	-49.73	Pass
5*	12.7180	35.30	18.62	0.24	35.54	18.86	73.00	60.00	-37.46	-41.14	Pass
6P	28.3420	30.36	17.20	0.74	31.10	17.94	73.00	60.00	-41.90	-42.06	Pass

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running	Phase:	N
Test Voltage:	AC 230V, 50/60Hz		



No.	Frequency (MHz)	QuasiPeak reading (dBuV)	Average reading (dBuV)	Correction factor (dB)	QuasiPeak result (dBuV)	Average result (dBuV)	QuasiPeak limit (dBuV)	Average limit (dBuV)	QuasiPeak margin (dB)	Average margin (dB)	Remark
1P	0.1940	15.29	0.21	9.72	25.01	9.93	79.00	66.00	-53.99	-56.07	Pass
2P	1.5340	14.24	-0.92	9.87	24.11	8.95	73.00	60.00	-48.89	-51.05	Pass
3P	3.0060	12.00	-1.59	9.93	21.93	8.34	73.00	60.00	-51.07	-51.66	Pass
4P	8.4180	12.99	-1.49	9.95	22.94	8.46	73.00	60.00	-50.06	-51.54	Pass
5*	12.7220	24.18	7.90	9.96	34.14	17.86	73.00	60.00	-38.86	-42.14	Pass
6P	25.5740	19.74	5.92	10.53	30.27	16.45	73.00	60.00	-42.73	-43.55	Pass

Note: Result=Reading+Factor Over Limit=Result-Limit

2.2. RADIATED EMISSION MEASUREMENT

LIMITS OF RADIATED EMISSION MEASUREMENT

(Below 1000MHz)

FREQUENCY (MHz)	At 10m	At 3m
	dBuV/m	dBuV/m
30 – 230	30	40
230 – 1000	37	47

LIMITS OF DISTURBANCE POWER MEASUREMENT

(Below 1000MHz)

Household and similar appliances		Tools						
Frequency Range			Rated motor power not exceeding 700 W		Rated motor power above 700 W and not exceeding 1 000 W		Rated motor power above 1 000 W	
(MHz)	dB (pW) Quasi-peak	dB (pW) Averag*	dB (pW) Quasi-peak	dB (pW) Averag*	dB (pW) Quasi-peak	dB (pW) Averag*	dB (pW) Quasi-peak	dB (pW) Average *
30-300	44-55	35-45	44-55	35-45	49-59	39-49	55-65	45-55

* 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.

Notes:

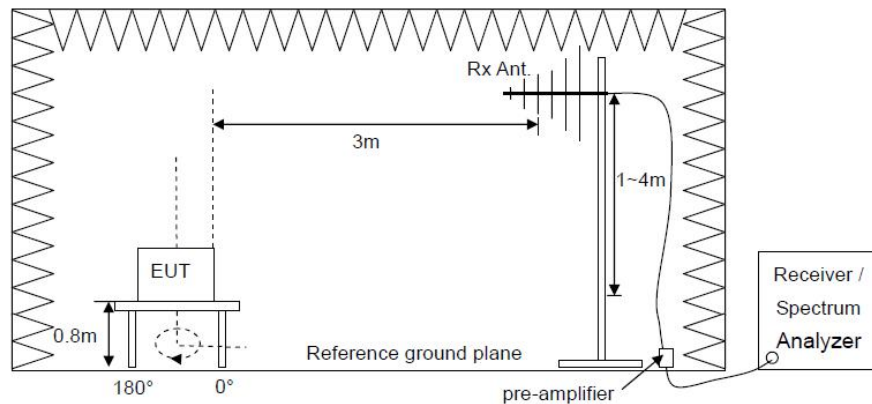
- (1) The limit for radiated test was performed according to as following: CISPR 14.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

TEST PROCEDURE

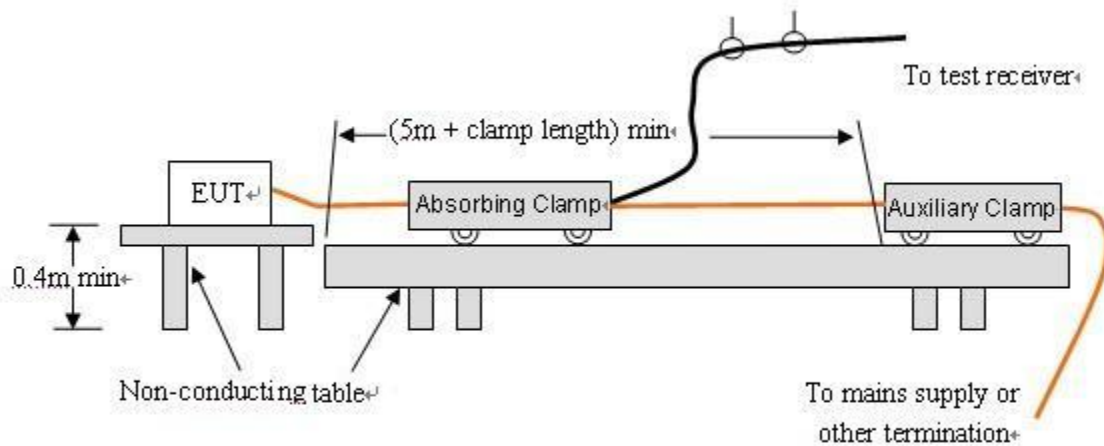
- a. The measuring distance of at 10 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 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, above 1G Average detector mode will be instead.
- e. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP(AV) Limits and then no additional QP Mode measurement performed.
- f. For the actual test configuration, please refer to the related Item –EUT Test Photos.

TEST SETUP

(A) Radiated Emission Test Set-Up Frequency Below 1 GHz.



(B) Disturbance Power Test Set-UP Frequency Below 1GHz

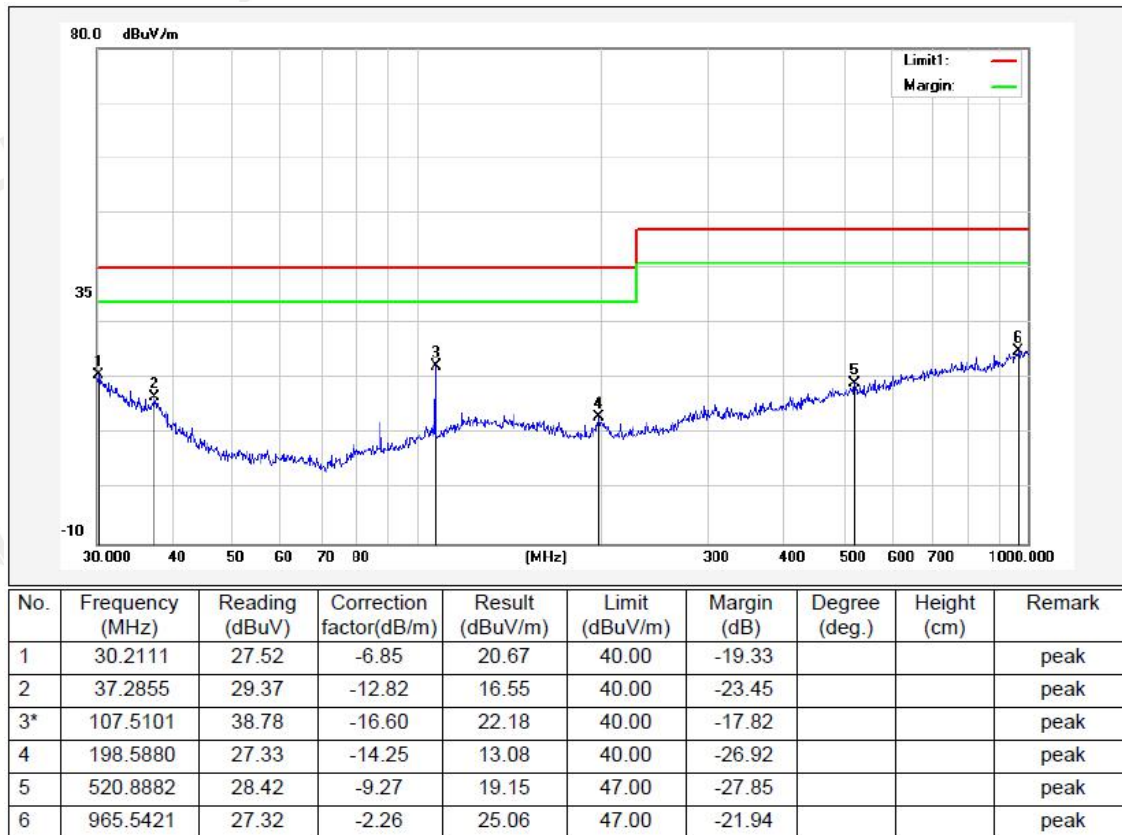


EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

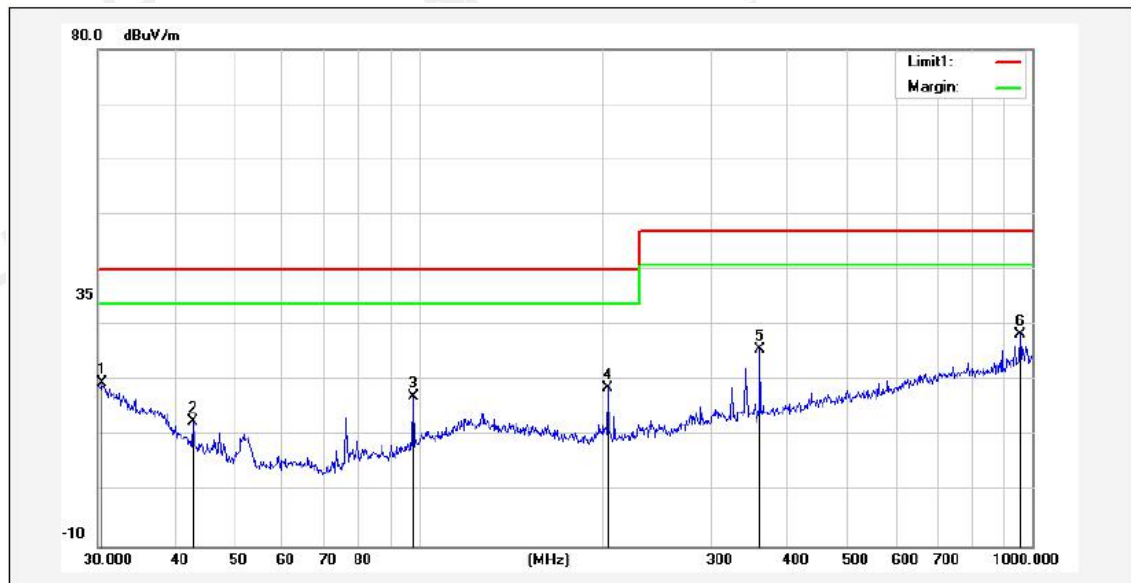
TEST RESULTS (30MHz-1000MHz)

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running	Position:	H
Test Power:	AC 230V, 50/60Hz		



Note: Result=Reading+Factor Over Limit=Result-Limit

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running	Position:	V



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	30.4238	26.53	-7.05	19.48	40.00	-20.52			peak
2	42.8998	29.66	-17.04	12.62	40.00	-27.38			peak
3	98.1419	34.75	-17.74	17.01	40.00	-22.99			peak
4	203.5228	33.46	-14.79	18.67	40.00	-21.33			peak
5	360.4477	37.43	-11.75	25.68	47.00	-21.32			peak
6*	955.4381	30.69	-2.35	28.34	47.00	-18.66			peak

Note: Result=Reading+Factor Over Limit=Result-Limit

2.3. HARMONICS CURRENT

LIMITS OF HARMONICS CURRENT

IEC 555-2					
Table - I			Table - II		
Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in Amperes)
Non Portable Tools or TV Receivers	Odd Harmonics		TV Receivers	Odd Harmonics	
	3	2.30		3	0.80
	5	1.14		5	0.60
	7	0.77		7	0.45
	9	0.40		9	0.30
	11	0.33		11	0.17
	13	0.21		13	0.12
	15≤n≤39	0.15 · 15/n		15≤n≤39	0.10 · 15/n
	Even Harmonics			Even Harmonics	
	2	1.08		2	0.30
	4	0.43		4	0.15
	8	0.30			
8≤n≤40	0.23 · 8/n	DC	0.05		

EN 61000-3-2/IEC 61000-3-2					
Equipment Category	Max. Permissible Harmonic Current (in Amperes)	Equipment Category	Harmonic Order n	Max. Permissible Harmonic Current (in A) (mA/w)	
Class A	Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required	Class D	3	2.30	3.4
			5	1.14	1.9
			7	0.77	1.0
			9	0.40	0.5
			11	0.33	0.35
			13≤n≤39	see Table I	3.85/n
			only odd harmonics required		

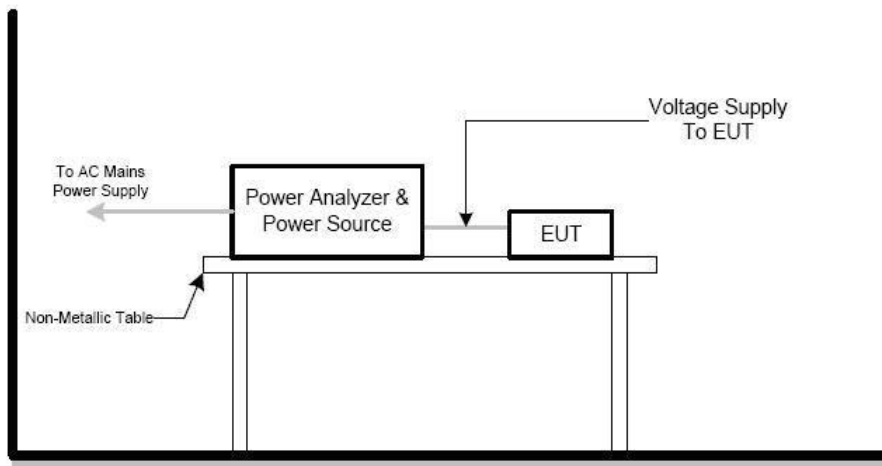
TEST PROCEDURE

- 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.
- 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. Portable tools.; Arc welding equipment which is not professional equipment.
 Class C: Lighting equipment.
 Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.
- 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.

EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

TEST SETUP



TEST RESULTS

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running		
Test Power:	AC 230V, 50/60Hz		

E. U. T. Result

Harmonic(s) > 200%:	
Order (n):	None
Harmonic(s) with average > 90%:	
Order (n):	None
Harmonic(s) between 150% and 200% during more than 10% of the test time or max. 10min:	
Order (n):	None

Power Source Result

First dataset out of limit:	
DS (time):	None
Harmonic(s) out of limit:	
Order (n):	None

Average harmonic current results

Hn	I _{eff} [A]	I _{eff} [%]	Limit [A]	Result
1	32.497E-3	100.000		
2	1.299E-3	3.998	972.00E-3	PASS
3	30.692E-3	94.445	2.07	PASS
4	1.816E-3	5.588	387.00E-3	PASS
5	29.329E-3	90.253	1.03	PASS
6	1.292E-3	3.977	270.00E-3	PASS
7	27.576E-3	84.858	693.00E-3	PASS
8	952.234E-6	2.930	207.00E-3	PASS
9	25.431E-3	78.258	360.00E-3	PASS
10	896.645E-6	2.759	165.60E-3	PASS
11	22.984E-3	70.728	297.00E-3	PASS
12	936.627E-6	2.882	138.00E-3	PASS
13	20.328E-3	62.555	189.00E-3	PASS
14	811.926E-6	2.498	118.29E-3	PASS
15	17.540E-3	53.975	135.00E-3	PASS
16	726.776E-6	2.236	103.50E-3	PASS
17	14.732E-3	45.335	119.11E-3	PASS
18	1.012E-3	3.114	92.00E-3	PASS
19	12.030E-3	37.019	106.58E-3	PASS
20	705.497E-6	2.171	82.80E-3	PASS
21	9.547E-3	29.379	96.43E-3	PASS
22	909.232E-6	2.798	75.28E-3	PASS
23	7.371E-3	22.682	88.05E-3	PASS
24	643.431E-6	1.980	68.99E-3	PASS
25	5.613E-3	17.273	81.00E-3	PASS
26	621.366E-6	1.912	63.69E-3	PASS
27	4.388E-3	13.504	75.00E-3	PASS
28	604.813E-6	1.861	59.14E-3	PASS
29	3.655E-3	11.249	69.83E-3	PASS
30	599.997E-6	1.846	55.20E-3	PASS
31	3.365E-3	10.356	65.32E-3	PASS
32	584.959E-6	1.800	51.75E-3	PASS
33	3.240E-3	9.969	61.36E-3	PASS
34	589.753E-6	1.815	48.71E-3	PASS
35	3.154E-3	9.706	57.86E-3	PASS
36	745.584E-6	2.294	46.00E-3	PASS
37	3.004E-3	9.245	54.73E-3	PASS
38	602.293E-6	1.853	43.58E-3	PASS
39	2.738E-3	8.426	51.92E-3	PASS
40	712.286E-6	2.192	41.40E-3	PASS

Maximum harmonic current results

Hn	I _{eff} [A]	I _{eff} [%]	Limit [A]	Result
1	32.829E-3	100.000		
2	2.053E-3	6.254	2.16	PASS
3	31.136E-3	94.843	4.60	PASS
4	3.390E-3	10.327	860.00E-3	PASS
5	30.083E-3	91.635	2.28	PASS
6	1.778E-3	5.417	600.00E-3	PASS
7	28.240E-3	86.020	1.54	PASS
8	1.451E-3	4.420	460.00E-3	PASS
9	26.091E-3	79.475	800.00E-3	PASS
10	1.393E-3	4.243	368.00E-3	PASS
11	23.548E-3	71.730	660.00E-3	PASS
12	1.215E-3	3.700	306.66E-3	PASS
13	20.749E-3	63.203	420.00E-3	PASS
14	1.094E-3	3.331	262.86E-3	PASS
15	17.851E-3	54.375	300.00E-3	PASS
16	1.036E-3	3.155	230.00E-3	PASS
17	14.934E-3	45.489	264.70E-3	PASS
18	1.292E-3	3.937	204.44E-3	PASS
19	12.201E-3	37.165	236.84E-3	PASS
20	967.940E-6	2.948	184.00E-3	PASS
21	9.662E-3	29.430	214.28E-3	PASS
22	1.174E-3	3.576	167.28E-3	PASS
23	7.515E-3	22.891	195.66E-3	PASS
24	884.520E-6	2.694	153.32E-3	PASS
25	5.762E-3	17.550	180.00E-3	PASS
26	844.765E-6	2.573	141.54E-3	PASS
27	4.499E-3	13.705	166.66E-3	PASS
28	782.868E-6	2.385	131.42E-3	PASS
29	3.756E-3	11.440	155.18E-3	PASS
30	750.699E-6	2.287	122.66E-3	PASS
31	3.476E-3	10.588	145.16E-3	PASS
32	759.436E-6	2.313	115.00E-3	PASS
33	3.429E-3	10.446	136.36E-3	PASS
34	766.301E-6	2.334	108.24E-3	PASS
35	3.396E-3	10.345	128.58E-3	PASS
36	980.017E-6	2.985	102.22E-3	PASS
37	3.248E-3	9.893	121.62E-3	PASS
38	796.979E-6	2.428	96.84E-3	PASS
39	2.981E-3	9.081	115.38E-3	PASS
40	957.699E-6	2.917	92.00E-3	PASS

Maximum harmonic voltage results

Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	231.38	100.599		
2	73.71E-3	0.032	0.2	PASS
3	118.14E-3	0.051	0.9	PASS
4	17.60E-3	0.008	0.2	PASS
5	39.89E-3	0.017	0.4	PASS
6	15.11E-3	0.007	0.2	PASS
7	46.20E-3	0.020	0.3	PASS
8	14.51E-3	0.006	0.2	PASS
9	41.06E-3	0.018	0.2	PASS
10	11.32E-3	0.005	0.2	PASS
11	44.90E-3	0.020	0.1	PASS
12	10.67E-3	0.005	0.1	PASS
13	40.80E-3	0.018	0.1	PASS
14	9.95E-3	0.004	0.1	PASS
15	37.21E-3	0.016	0.1	PASS
16	10.53E-3	0.005	0.1	PASS
17	34.50E-3	0.015	0.1	PASS
18	10.00E-3	0.004	0.1	PASS
19	21.94E-3	0.010	0.1	PASS
20	11.21E-3	0.005	0.1	PASS
21	45.11E-3	0.020	0.1	PASS
22	9.99E-3	0.004	0.1	PASS
23	20.80E-3	0.009	0.1	PASS
24	14.25E-3	0.006	0.1	PASS
25	18.43E-3	0.008	0.1	PASS
26	10.98E-3	0.005	0.1	PASS
27	21.66E-3	0.009	0.1	PASS
28	11.93E-3	0.005	0.1	PASS
29	40.50E-3	0.018	0.1	PASS
30	10.68E-3	0.005	0.1	PASS
31	19.94E-3	0.009	0.1	PASS
32	10.30E-3	0.004	0.1	PASS
33	17.33E-3	0.008	0.1	PASS
34	10.45E-3	0.005	0.1	PASS
35	18.79E-3	0.008	0.1	PASS
36	10.45E-3	0.005	0.1	PASS
37	28.09E-3	0.012	0.1	PASS
38	9.74E-3	0.004	0.1	PASS
39	24.44E-3	0.011	0.1	PASS
40	12.46E-3	0.005	0.1	PASS

Harmonic current results - DS: 22

Hn	I _{eff} [A]	I _{eff} [%]	Limit [A]	Result
1	32.561E-3	100.000		
2	1.407E-3	4.323	1.08	PASS
3	30.902E-3	94.905	2.30	PASS
4	2.826E-3	8.680	430.00E-3	PASS
5	30.071E-3	92.353	1.14	PASS
6	1.277E-3	3.922	300.00E-3	PASS
7	28.178E-3	86.539	770.00E-3	PASS
8	1.004E-3	3.082	230.00E-3	PASS
9	26.049E-3	80.001	400.00E-3	PASS
10	900.316E-6	2.765	184.00E-3	PASS
11	23.490E-3	72.140	330.00E-3	PASS
12	915.808E-6	2.813	153.33E-3	PASS
13	20.748E-3	63.720	210.00E-3	PASS
14	793.970E-6	2.438	131.43E-3	PASS
15	17.851E-3	54.822	150.00E-3	PASS
16	745.497E-6	2.290	115.00E-3	PASS
17	14.902E-3	45.765	132.35E-3	PASS
18	1.193E-3	3.663	102.22E-3	PASS
19	12.094E-3	37.143	118.42E-3	PASS
20	693.706E-6	2.130	92.00E-3	PASS
21	9.510E-3	29.206	107.14E-3	PASS
22	1.132E-3	3.477	83.64E-3	PASS
23	7.315E-3	22.465	97.83E-3	PASS
24	668.640E-6	2.053	76.66E-3	PASS
25	5.512E-3	16.928	90.00E-3	PASS
26	662.294E-6	2.034	70.77E-3	PASS
27	4.305E-3	13.222	83.33E-3	PASS
28	649.062E-6	1.993	65.71E-3	PASS
29	3.618E-3	11.112	77.59E-3	PASS
30	632.252E-6	1.942	61.33E-3	PASS
31	3.444E-3	10.577	72.58E-3	PASS
32	608.284E-6	1.868	57.50E-3	PASS
33	3.323E-3	10.206	68.18E-3	PASS
34	573.288E-6	1.761	54.12E-3	PASS
35	3.273E-3	10.052	64.29E-3	PASS
36	928.190E-6	2.851	51.11E-3	PASS
37	3.171E-3	9.738	60.81E-3	PASS
38	606.135E-6	1.862	48.42E-3	PASS
39	2.797E-3	8.589	57.69E-3	PASS
40	916.792E-6	2.816	46.00E-3	PASS

Caution: Results related to the 100% limit values

Harmonic voltage results - DS: 22

Hn	Ueff [V]	Ueff [%]	Limit [%]	Result
1	231.37	100.594		
2	56.61E-3	0.025	0.2	PASS
3	98.20E-3	0.043	0.9	PASS
4	6.66E-3	0.003	0.2	PASS
5	35.37E-3	0.015	0.4	PASS
6	6.01E-3	0.003	0.2	PASS
7	38.57E-3	0.017	0.3	PASS
8	599.76E-6	0.000	0.2	PASS
9	32.03E-3	0.014	0.2	PASS
10	9.29E-3	0.004	0.2	PASS
11	30.48E-3	0.013	0.1	PASS
12	4.31E-3	0.002	0.1	PASS
13	34.38E-3	0.015	0.1	PASS
14	3.40E-3	0.001	0.1	PASS
15	30.32E-3	0.013	0.1	PASS
16	2.68E-3	0.001	0.1	PASS
17	30.97E-3	0.013	0.1	PASS
18	5.19E-3	0.002	0.1	PASS
19	11.73E-3	0.005	0.1	PASS
20	8.01E-3	0.003	0.1	PASS
21	41.84E-3	0.018	0.1	PASS
22	3.10E-3	0.001	0.1	PASS
23	11.97E-3	0.005	0.1	PASS
24	2.73E-3	0.001	0.1	PASS
25	13.32E-3	0.006	0.1	PASS
26	4.32E-3	0.002	0.1	PASS
27	10.01E-3	0.004	0.1	PASS
28	4.48E-3	0.002	0.1	PASS
29	33.31E-3	0.014	0.1	PASS
30	2.35E-3	0.001	0.1	PASS
31	13.06E-3	0.006	0.1	PASS
32	5.47E-3	0.002	0.1	PASS
33	16.34E-3	0.007	0.1	PASS
34	2.67E-3	0.001	0.1	PASS
35	16.24E-3	0.007	0.1	PASS
36	1.18E-3	0.001	0.1	PASS
37	22.01E-3	0.010	0.1	PASS
38	4.85E-3	0.002	0.1	PASS
39	14.27E-3	0.006	0.1	PASS
40	4.35E-3	0.002	0.1	PASS

2.4. VOLTAGE FLUCTUATION AND FLICKERS

LIMITS OF VOLTAGE FLUCTUATION AND FLICKERS

Tests	Limits		Descriptions
	IEC555-3	IEC/EN 61000-3-3	
Pst	≤ 1.0 , $T_p = 10$ min.	≤ 1.0 , $T_p = 10$ min.	Short Term Flicker Indicator
Plt	N/A	≤ 0.65 , $T_p = 2$ hr.	Long Term Flicker Indicator
dc	$\leq 3\%$	$\leq 3.3\%$	Relative Steady-State V-Chang
dmax	$\leq 4\%$	$\leq 4\%$	Maximum Relative V-change
d (t)	N/A	$\leq 3.3\%$ for > 500 ms	Relative V-change characteristic

EST PROCEDURE

a. Harmonic Current Test:

Test was performed according to the procedures specified in Clause 5.0 of IEC555-2 and/or Sub-clause 6.2 of IEC/EN 61000-3-2 depend on which standard adopted for compliance measurement.

b. Fluctuation and Flickers Test:

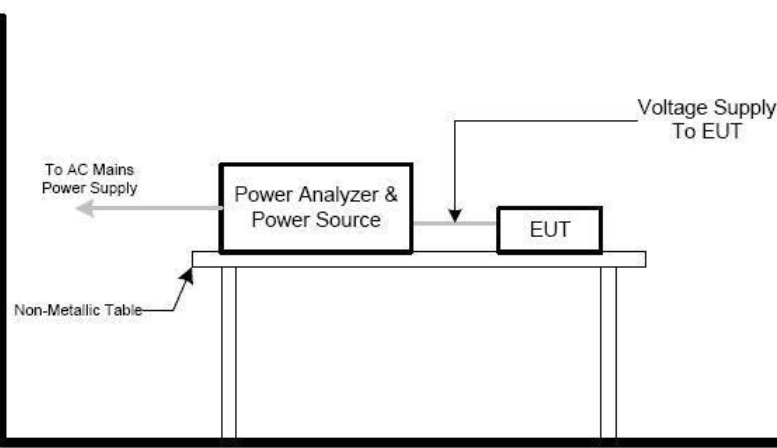
Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

c. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

TEST SETUP



TEST RESULTS

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running		
Test Power:	AC 230V, 50/60Hz		

Maximum Flicker results

	EUT values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.004	3.30	PASS
dmax [%]	0.170	7.00	PASS
dt [s]	0.000	0.50	PASS

3. EMC IMMUNITY TEST

3.1. STANDARD COMPLIANCE/ SERVITY LEVEL/ CRITERIA

Tests Standard No.	TEST SPECIFICATION	Test Mode Test Ports	Perform. Criteria
1. ESD IEC/EN 61000-4-2	8KV air discharge 4KV contact discharge	Direct Mode	B
	4KV HCP discharge 4KV VCP discharge	Indirect Mode	B
2. RS IEC/EN 61000-4-3	80 MHz to 1000 MHz, 1000Hz, 80%, AM modulated	Enclosure	A
3. EFT/Burst IEC/EN 61000-4-4	5/50ns Tr/Th 5KHz Repetition Freq.	Power Supply Port	B
	5/50ns Tr/Th 5KHz Repetition Freq.	CTL/Signal Data Line Port	B
4. Surges IEC/EN 61000-4-5	1.2/50(8/20) Tr/Th us	L-N	B
	1.2/50(8/20) Tr/Th us	L-PE N-PE	B
5 Injected Current IEC/EN 61000-4-6	0.15 MHz to 80 MHz, 1000Hz 80 % , AM Modulated 150Ω source impedance	CTL/Signal Port	A
	0.15 MHz to 80 MHz, 1000Hz 80 % , AM Modulated 150Ω source impedance	AC Power Port	A
	0.15 MHz to 80 MHz, 1000Hz 80 % , AM Modulated 150Ω source impedance	DC Power Port	A
6. Power Frequency Magnetic Field IEC/EN 61000-4-8	50 Hz,	Enclosure	A
7. Volt. Interruptions Volt. Dips IEC/EN 61000-4-11	Voltage dip 0%	AC Power Port	C
	Voltage dip 30%		C
	Voltage dip 60%		C

3.2. GENERAL PERFORMANCE CRITERIA

According to **EN 55014-2** standard, the general performance criteria as following:

Criterion A	The equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment if used as intended.
Criterion B	After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is allowed. However, no change of operating state or stored data is allowed to persist after the test.
Criterion C	Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. Functions, and/or information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

3.3. GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **2.3** Unless otherwise a special operating condition is specified in the follows during the testing.

3.4. ESD TESTING

TEST SPECIFICATION

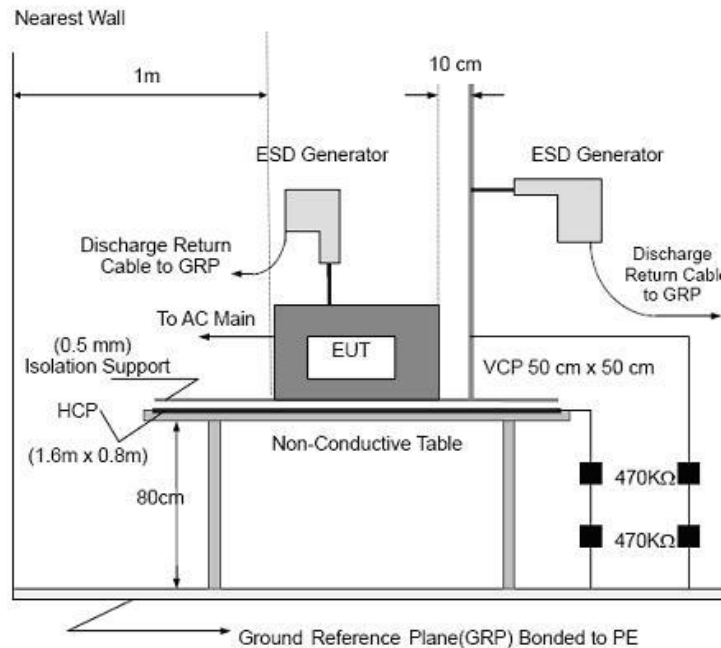
Basic Standard:	IEC/EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Required Performance	B
Discharge Voltage:	Air Discharge: 2kV/4kV/8kV (Direct) Contact Discharge: 2kV/4kV (Direct/Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Air Discharge: min. 20 times at each test point Contact Discharge: min. 20 at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a. Contact discharge was applied to conductive surfaces and coupling planes of the EUT.
During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges. If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.
Vertical Coupling Plane (VCP):
The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane.
The four faces of the EUT will be performed with electrostatic discharge.
Horizontal Coupling Plane (HCP):
The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane.
The four faces of the EUT will be performed with electrostatic discharge.
- b. Air discharges at insulation surfaces of the EUT.
It was at least ten single discharges with positive and negative at the same selected point.

TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

TEST RESULTS

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running		
Test Power:	AC 230V, 50/60Hz		

Mode	Air Discharge								Contact Discharge								Criterion	Result
Test level (kV)	4		8		10		15		2		4		6		8			
Test Location	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-		
HCP									A	A	A	A					B	PASS
VCP									A	A	A	A						PASS
Slots	A	A	A	A														PASS
Surface	A	A	A	A														PASS
																		PASS

Note:

- 1) +/- denotes the Positive/Negative polarity of the output voltage.
- 2) Test condition:
Direct / Indirect (HCP/VCP) discharges: Minimum 50 times (Positive/Negative) at each point. Air discharges: Minimum 10 times (Positive/Negative) at each point.
- 3) Test location(s) in which discharge (Air and contact discharge) to be applied illustrated by photos shown in next page(s)
- 4) The Indirect (HCP/VCP) discharges description of test point as following:
1. left side 2.right side 3.front side 4.rear side.
- 5) N/A - denotes test is not applicable in this test report.

3.5. RS TESTING

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-3
Required Performance	A
Frequency Range:	80 MHz - 1000 MHz
Field Strength:	3 V/m
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Test Distance:	3 m
Antenna Height:	1.5 m
Dwell Time:	at least 3 seconds

TEST PROCEDURE

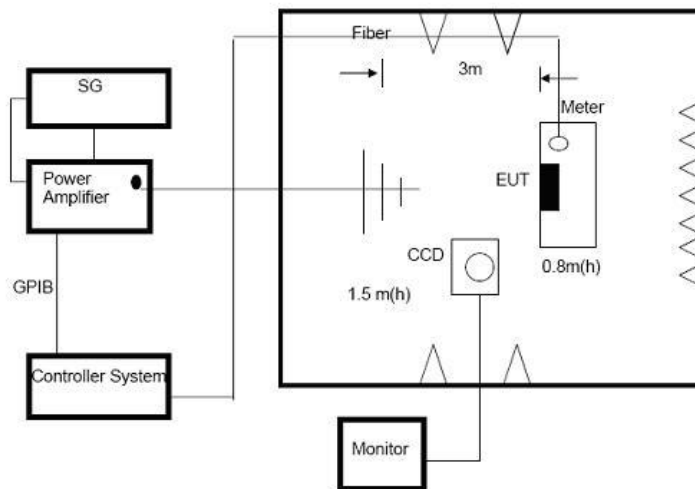
The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

The testing distance from antenna to the EUT was 3 meters.

The other condition as following manner:

- The frequency range is swept from 80 MHz to 1000 MHz, & 1400MHz - 2700MHz with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- Sweep Frequency 900 MHz, with the Duty Cycle: 1/8 and Modulation: Pulse 217 Hz(if applicable)
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

TEST RESULTS

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running		
Test Power:	AC 230V, 50/60Hz		

Frequency Range (MHz)	RF Field Position	R.F. Field Strength	Azimuth	Perform. Criteria	Results	Judgment
80MHz - 1000MHz	H / V	3 V/m (rms) AM Modulated 1000Hz, 80%	Front	A	A	PASS
			Rear			
			Left			
			Right			

Note:

- 1) N/A - denotes test is not applicable in this test report.
- 2) Criteria A: There was no change operated with initial operating during the test.
- 3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 4) Criteria C: The system shut down during the test.

3.6. EFT/BURST TESTING

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-4
Required Performance	B
Test Voltage:	Power Line: 1 kV Signal/Control Line: 0.5 KV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Wave shape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- The length of power cord between the coupling device and the EUT should not exceed 1 meter.
- Both positive and negative polarity discharges were applied.
- The duration time of each test sequential was 1 minute.

Nearest Wall

$>0.5\text{m}$

EUT

$L \leq 1\text{m}$

EFT/Burst Generator

Coupling/Decoupling Network Device

To AC Mains Supply

Protective GND

80 cm

Ground Reference Plane (GRP)

Protective GND According

To Earth

Ground Reference Plane (GRP) Bonded to Earth

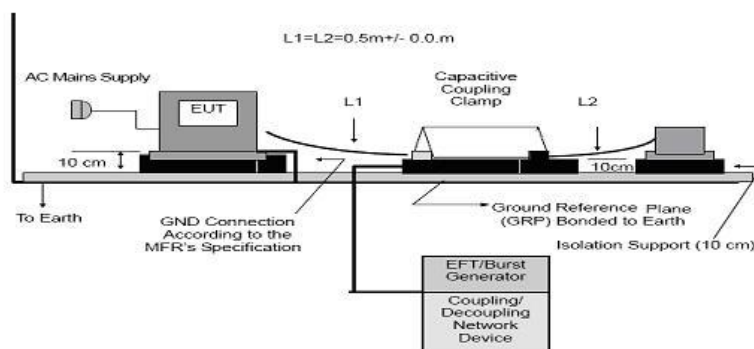


TABLE-TOP EQUIPMENT

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

TEST RESULTS

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running		
Test Power:	AC 230V, 50/60Hz		

Coupling Line		Test level (kV)								Criterion	Result
		0.5		1		2		4			
		+	-	+	-	+	-	+	-		
AC line	L	A	A	A	A					B	pass
	N	A	A	A	A						pass
	PE										
	L+N	A	A	A	A						pass
	L+PE										
	N+PE										
	L+N+PE										
DC Line											
Signal Line											

Note:

- 1) +/- denotes the Positive/Negative polarity of the output voltage.
- 2) N/A - denotes test is not applicable in this test report.
- 3) Criteria A: There was no change operated with initial operating during the test.
- 4) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 5) Criteria C: The system shut down during the test.

3.7. SURGE TESTING

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-5
Required Performance	B
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Line: 0.5 kV, 1 kV, 2 kV
Surge Input/Output:	L-N, L-PE, N-PE
Generator Source:	2 ohm between networks
Impedance:	12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0 /90/180/270°
Pulse Repetition Rate:	1 time / min. (maximum)
Number of Tests:	5 positive and 5 negative at selected points

TEST 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 2meters in length (or shorter).

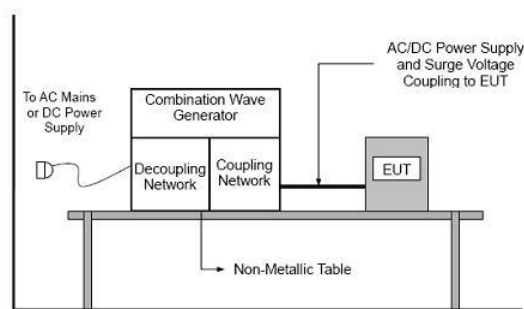
b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

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:

d. 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 SETUP



TEST RESULTS

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running		
Test Power:	AC 230V, 50/60Hz		

Coupling Line			Test level								Criterion	Result
			0.5 kV		1 kV		2 kV		4 kV			
			+	-	+	-	+	-	+	-		
AC line	L-N	0°	A	A	A	A					B	pass
		90°	A	A	A	A						
		180°	A	A	A	A						
		270°	A	A	A	A						
	L-PE	0°										
		90°										
		180°										
		270°										
	N-PE	0°										
		90°										
		180°										
		270°										
DC Line												
Signal Line												

Note:

- 1) Polarity and Numbers of Impulses: 5 Pst / Ngt at each tested mode.
- 2) N/A - denotes test is not applicable in this Test Report.
- 3) Criteria A: There was no change operated with initial operating during the test.
- 4) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 5) Criteria C: The system shut down during the test.

3.8. INJECTION CURRENT TESTING

TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-6
Required Performance	A
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	3 Vr.m.s.
Modulation:	1kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Dwell Time:	at least 3 seconds

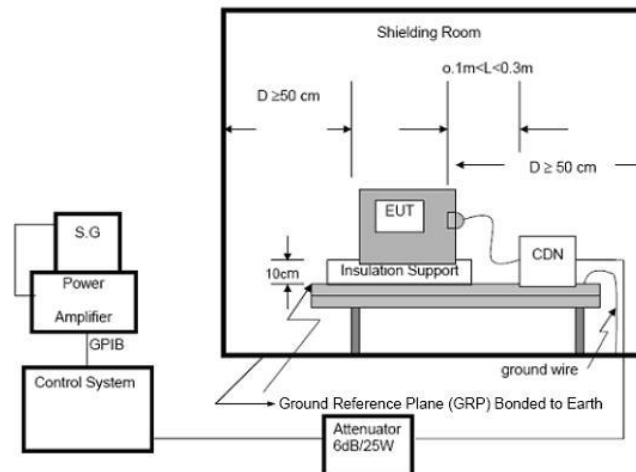
TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- The frequency range is swept from 150 KHz to 80 MHz, with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.

TEST SETUP



NOTE:

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

TEST RESULTS

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running		
Test Power:	AC 230V, 50/60Hz		

Test Ports (Mode)	Freq. Range MHz)	Field Strength	Perform. Criteria	Results	Judgment
Input/ Output AC. Power Port	0.15 ---80	3V(rms) AM Modulated 1000Hz, 80%	A	A	pass
Input/ Output DC. Power Port	0.15 --- 80		A	N/A	pass
Signal Line	0.15 --- 80		A	N/A	pass

Note:

- 1) N/A - denotes test is not applicable in this Test Report.
- 2) Criteria A: There was no change operated with initial operating during the test.
- 3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 4) Criteria C: The system shut down during the test.

3.9. VOLTAGE INTERRUPTION/DIPS TESTING

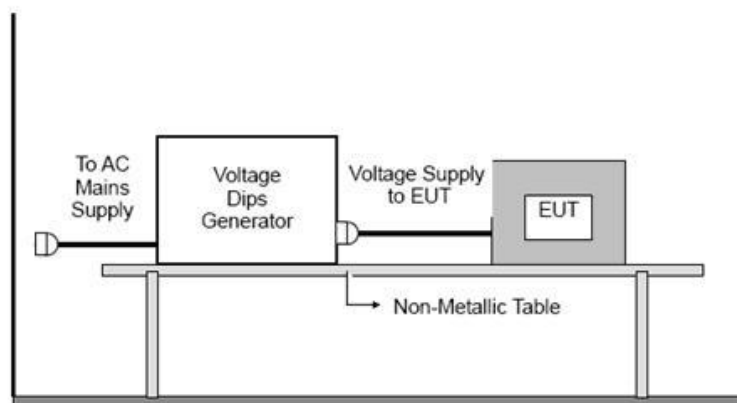
TEST SPECIFICATION

Basic Standard:	IEC/EN 61000-4-11
Required Performance:	C (For 0% Voltage Dips) C (For 30% Voltage Dips) C (For 60% Voltage Dips)
Test Duration Time:	Minimum three test events in sequence
Interval between Event:	Minimum ten seconds
Phase Angle:	0°/45°/90°/135°/180°/225°/270°/315°/360°
Test Cycle:	3 times

TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three 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.

TEST SETUP



TEST RESULTS

EUT:	DUCT BOOSTER FAN	Model Name:	ZTF-250
Temperature:	22 °C	Relative Humidity:	46%
Pressure:	1010hPa	Test Date:	2018-10-10
Test Mode:	Running		
Test Power:	AC 230V, 50/60Hz		

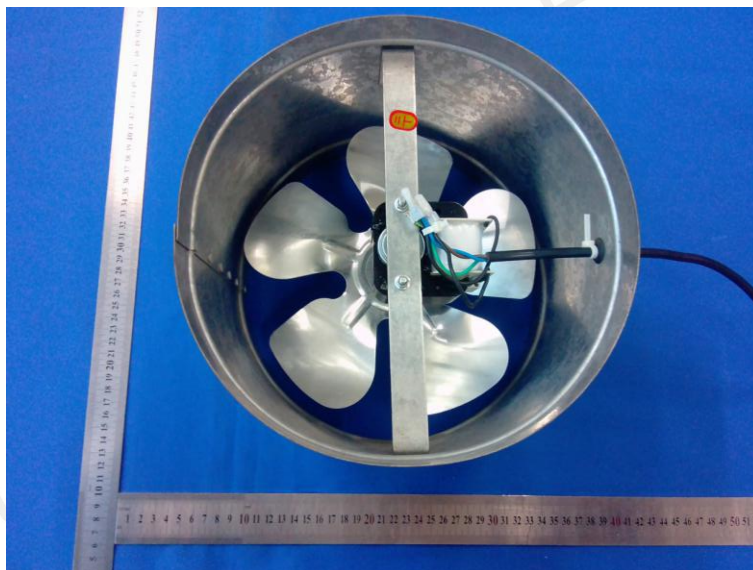
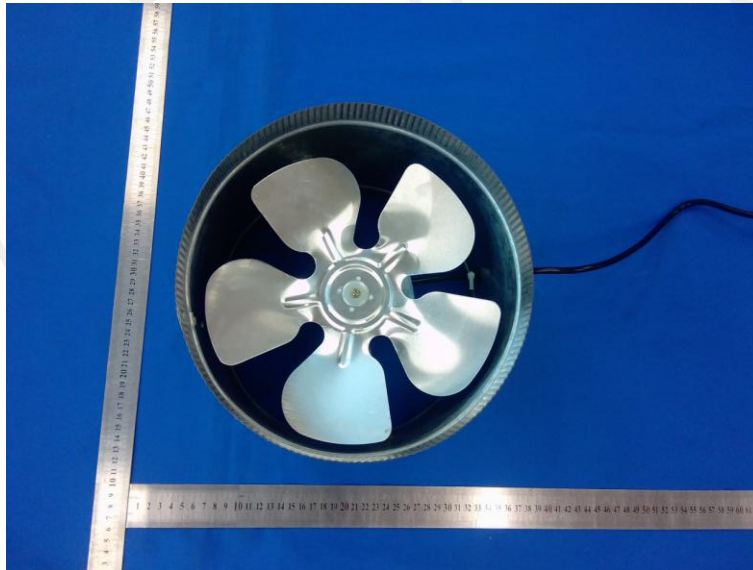
Interruption & Dips	Duration (T)	Perform Criteria	Results	Judgment
Voltage dip 0%	0.5	C	B	pass
Voltage dip 60%	10	C	B	pass
Voltage dip 30%	50	C	B	pass

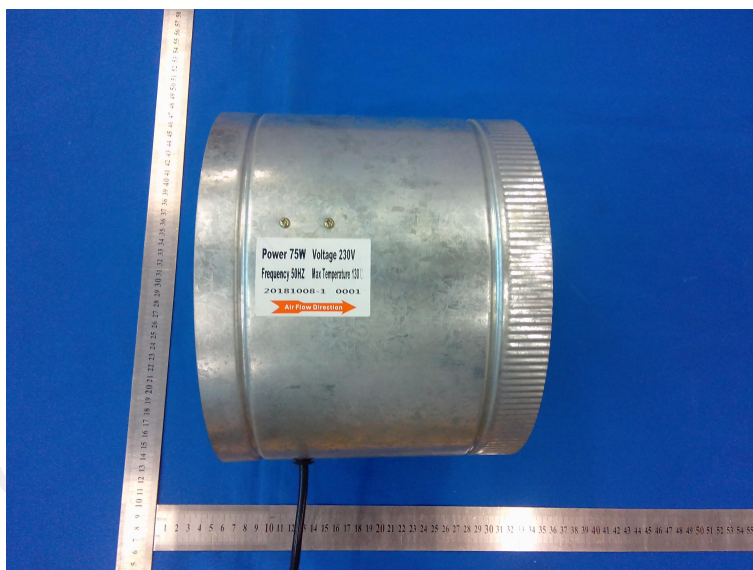
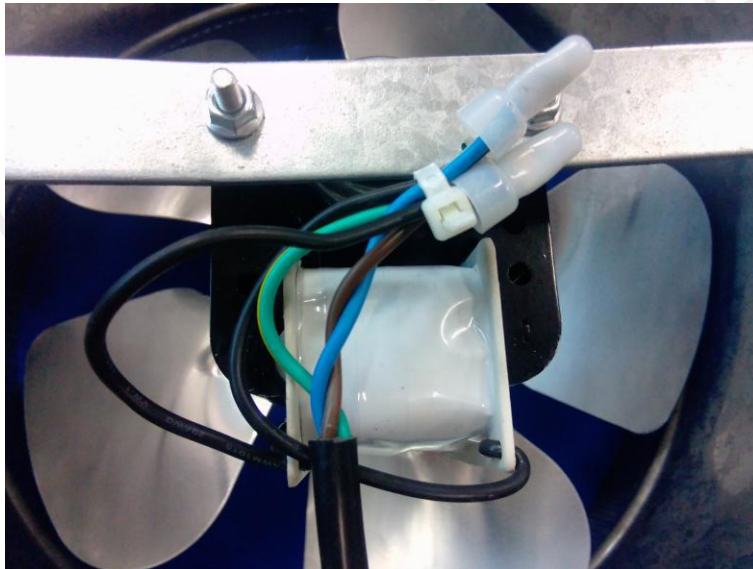
Note:

- 1). N/A - denotes test is not applicable in this test report.
- 2) Criteria A: There was no change operated with initial operating during the test.
- 3) Criteria B: The EUT function loss during the test, but self-recoverable after the test.
- 4) Criteria C: The system shut down during the test.



APPENDIX I







End of the Report