



EMC TEST REPORT

EN IEC 61000-6-4:2019

EN IEC 61000-6-2:2019

MEASUREMENT AND TEST REPORT

FOR

Shenzhen Shen Wangda Technology Co.,Ltd

4th floor, buiding C, KelunTe Low-carbonindustrial park, HuaRong Road, Longhua area, ShenZhen

Model: TBK958A, TBK958B, TBK958C, TBK958D, TBK958E, TBK958F, TBK958G, TBK958H, TBK958I, TBK958J, TBK958K, TBK958L, TBK958M, TBK958N, TBK958O, TBK958P, TBK958Q, TBK958R, TBK958S, TBK958T, TBK958U, TBK958V, TBK958W, TBK958X, TBK958Y, TBK958Z

2021-06-24

This Report Concerns:	Equipment Type:
Original Report	laser machine
Test Engineer:	Eric Tao/ <i>Eric Tao</i>
Report Number:	TH2106189-C01-R03
Test Date:	2021-06-17 to 2021-06-23
Reviewed By:	Prince Huang/ <i>Prince Huang</i>
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Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior written consent of TianHai Compliance Testing Laboratory Ltd.



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1 - GENERAL ENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: **Shenzhen Shen Wangda Technology Co.,Ltd**
Address of applicant: 4th floor, buiding C, KelunTe Low-carbonindustrial park, HuaRong Road,
Longhua area, ShenZhen
Manufacturer: **Shenzhen Shen Wangda Technology Co.,Ltd**
Address of manufacturer: 4th floor, buiding C, KelunTe Low-carbonindustrial park, HuaRong Road,
Longhua area, ShenZhen

General Description of E.U.T

EUT Description: **laser machine**
Trademark: TBK
Model No.: TBK958A, TBK958B, TBK958C, TBK958D, TBK958E, TBK958F, TBK958G,
TBK958H, TBK958I, TBK958J, TBK958K, TBK958L, TBK958M, TBK958N,
TBK958O, TBK958P, TBK958Q, TBK958R, TBK958S, TBK958T, TBK958U,
TBK958V, TBK958W, TBK958X, TBK958Y, TBK958Z
Power Rating: Input: AC 110V-220V 50-60Hz 3A 500W
Note: All tests performed on model: TBK958A.

Remark: * The test data gathered are from the production sample provided by the manufacturer.

1.2 Test Standards

The following Declaration of Conformity report of EUT is prepared in accordance with

EN IEC 61000-6-4:2019

EN IEC 61000-6-2:2019

The objective of the manufacturer is to demonstrate compliance with the described standards above.



1.3 Test Summary

For the EUT described above. The standards used were EN IEC 61000-6-4 for Emissions & EN IEC 61000-6-2:2019 for Immunity.

Table 1 : Tests Carried Out Under EN IEC 61000-6-4:2019

Standard	Test Items	Status
EN IEC 61000-6-4:2019	Disturbance Voltage at The Mains Terminals (150KHz To 30MHz)	√
	Radiated Disturbances (30MHz To 1000MHz)	√

- √ Indicates that the test is applicable
- × Indicates that the test is not applicable

Table 2 : Tests Carried Out Under EN IEC 61000-6-2:2019

Standard	Test Items	Status
EN 61000-4-2:2009	Electrostatic discharge Immunity	√
EN 61000-4-3:2006+A2:2010	Radiated Susceptibility (80MHz to 1GHz 1.4 GHz to 2.7GHz)	√
EN 61000-4-4:2012	Electrical Fast Transient/Burst Immunity	√
EN 61000-4-5:2014	Surge Immunity	√
EN 61000-4-6:2014	Conducted Susceptibility (150kHz to 80MHz)	√
EN 61000-4-8:2010	Power Frequency Magnetic Field Immunity (50/60Hz)	×
EN 61000-4-11:2004	Voltage Dips, Short Interruptions Immunity	√

- √ Indicates that the test is applicable
- ×

1.4 Test Methodology

All measurements contained in this report were conducted with CISPR 16-1-1: 2006, radio disturbance and immunity measuring apparatus, and CISPR16-2-3: 2010, Method of measurement of disturbances and immunity.



2 - SYSTEM TEST CONFIGURATION

2.1 Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

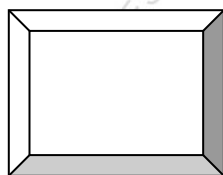
2.2 EUT Exercise Software

The EUT exercising program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software offered by manufacture, can let the EUT being normal operation.

2.3 Equipment Modifications

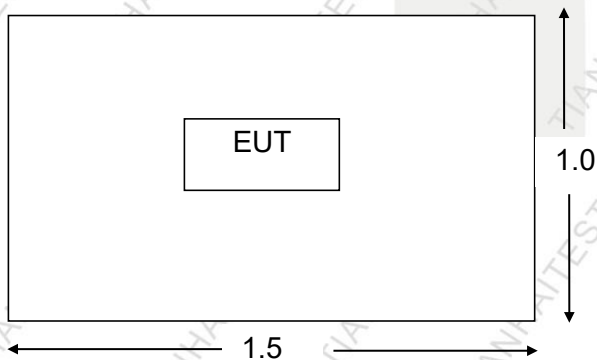
The EUT tested was not modified by TH.

2.4 Basic Configuration of Test System



EUT

2.5 Test Setup Diagram





3.4 Instruments Setup

The test receiver was set with the following configurations:

Test Receiver Setting:

Frequency Range.....150 KHz to 30 MHz
 Detector.....Peak & Quasi-Peak & Average
 Sweep Speed.....Auto
 IF Band Width.....9 KHz

3.5 Test Procedure

During the conducted emission test, the EUT power cord was connected to the auxiliary outlet of the first Artificial Mains.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance using all installation combination.

All data was recorded in the peak detection mode. Quasi-peak and Average readings were only performed when an emission was found to be marginal (within -10 dB μ V of specification limits). Quasi-peak readings are distinguished with a "QP". Average readings are distinguished with a "AV".

3.6 Summary of Test Results

According to the data in section 3.6, the EUT complied with the EN 55014-1 Conducted margin, which represented worst margin reading.

3.7 Disturbance Voltage Test Data

Temperature (°C)	15~35
Humidity (%RH)	30~60
Barometric Pressure (mbar)	860~1060
EUT	laser machine
M/N	TBK958A
Operating Mode	On

Test data see following pages

3.8 Test Equipment List and Details

No.	Instrument no.	Equipment	Manufacturer	Model No.	S/N	Last Calculator	Due Calculator
1	BCT-EMC001	EMI Test Receiver	R&S	ESCI	100687	2021-03-12	2022-03-11
2	BCT-EMC020	Teo Line Single Phase Module	SCHWARZBECK	NSLK8128	8128247	2021-03-12	2022-03-11
3	BCT-EMC032	10dB attenuator	ELECTRO-METRICS	EM-7600	836	2021-03-12	2022-03-11

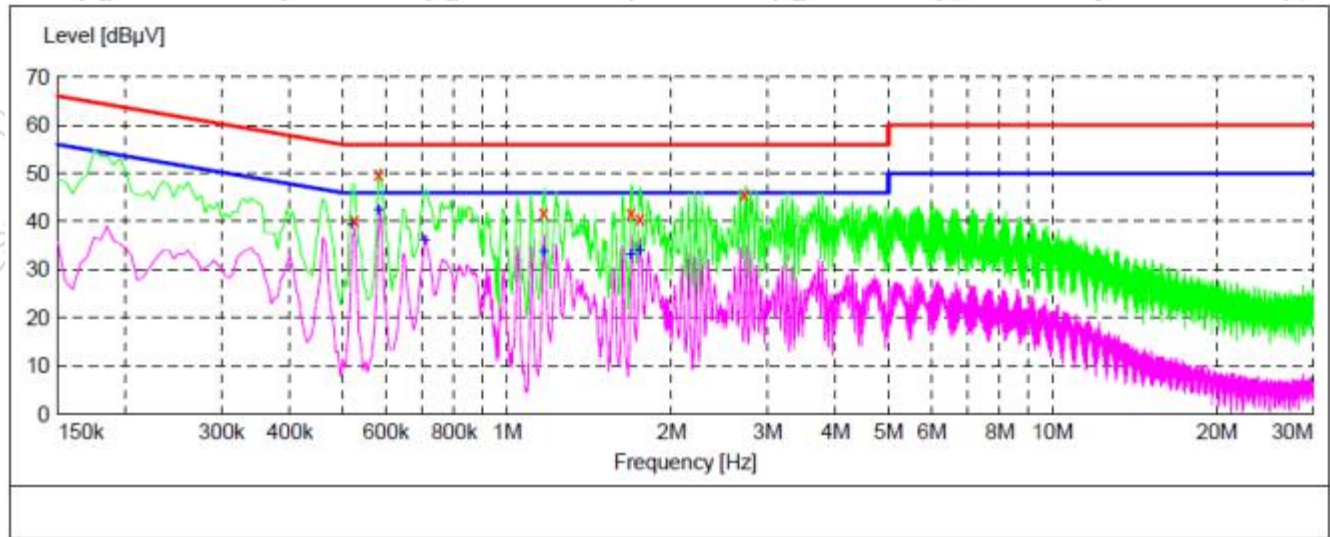
3.9 Test Result

PASS



Disturbance Voltage Test Data Conducted Emission Test Data

EUT: laser machine M/N: TBK958A
 Operating Condition: ON
 Test Site: Shielded Room
 Operator: Eric
 Test Specification: 230V AC
 Comment: Live Line Tem:26°C Hum:60%

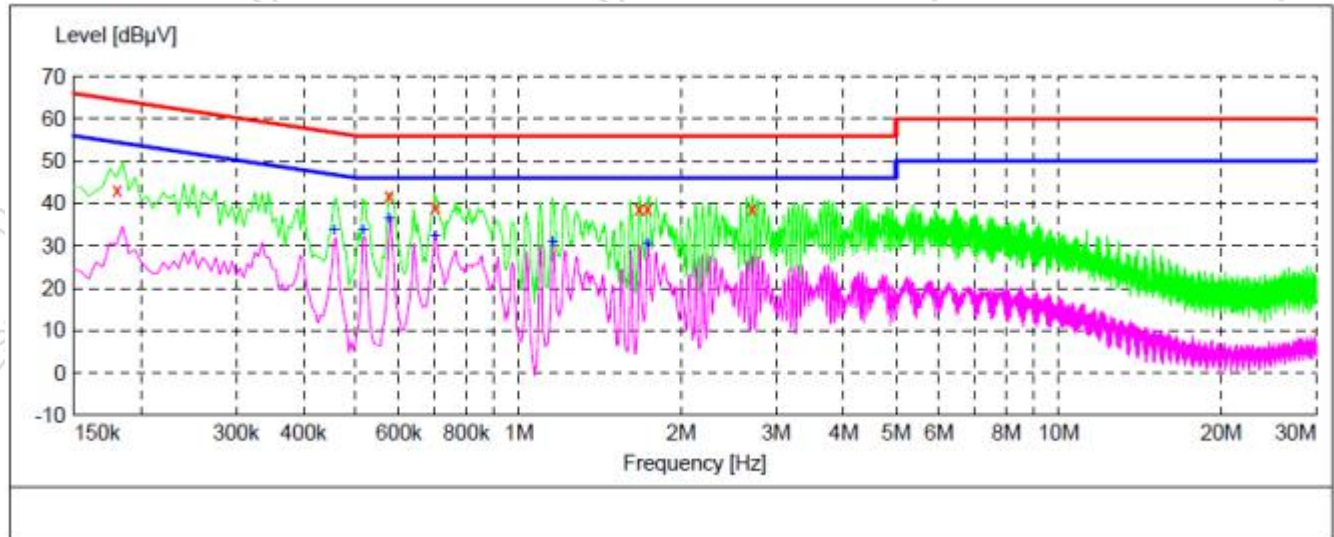


Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.525000	40.30	10.3	56	15.7	QP	L1	GND
0.580000	49.80	10.3	56	6.2	QP	L1	GND
1.165000	41.80	10.3	56	14.2	QP	L1	GND
1.685000	41.70	10.3	56	14.3	QP	L1	GND
1.750000	40.50	10.3	56	15.5	QP	L1	GND
2.720000	45.60	10.3	56	10.4	QP	L1	GND
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.520000	39.40	10.3	46	6.6	AV	L1	GND
0.580000	42.40	10.3	46	3.6	AV	L1	GND
0.705000	36.10	10.3	46	9.9	AV	L1	GND
1.165000	33.70	10.3	46	12.3	AV	L1	GND
1.685000	33.10	10.3	46	12.9	AV	L1	GND
1.745000	34.20	10.3	46	11.8	AV	L1	GND



Conducted Emission Test Data

EUT: laser machine M/N: TBK958A
 Operating Condition: ON
 Test Site: Shielded Room
 Operator: Eric
 Test Specification: 230V AC
 Comment: Live Line Tem:26°C Hum:60%



Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.180000	43.20	11.9	65	21.3	QP	N	GND
0.575000	41.80	10.3	56	14.2	QP	N	GND
0.700000	39.20	10.3	56	16.8	QP	N	GND
1.670000	38.80	10.3	56	17.2	QP	N	GND
1.730000	38.70	10.3	56	17.3	QP	N	GND
2.705000	38.80	10.3	56	17.2	QP	N	GND
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.455000	33.50	10.4	47	13.3	AV	N	GND
0.515000	33.80	10.3	46	12.2	AV	N	GND
0.575000	36.30	10.3	46	9.7	AV	N	GND
0.700000	32.30	10.3	46	13.7	AV	N	GND
1.155000	31.00	10.3	46	15.0	AV	N	GND
1.730000	30.60	10.3	46	15.4	AV	N	GND



4- RADIATED DISTURBANCES

4.1 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is 4.0 dB.

4.2 Limit of Radiated Disturbances (Class B)

Frequency (MHz)	Distance (Meters)	Field Strengths Limits (dBμV/m)
30 ~ 230	3	40
230 ~ 300	3	47

Note: (1) The tighter limit shall apply at the edge between two frequency bands.

(2) Distance refers to the distance in meters between the test instrument antenna and the closest point of any part of the E.U.T.

4.3 EUT Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup accordance with the CISPR 16-1: 2002, CISPR16-2: 2002. The specification used was EN61000-6-3 Class B limits.

The EUT was placed on the center of the test table.

Maximum emission emitted from EUT was determined by manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation and the levels in the final result of the test were recorded with the EUT running in the operating mode that maximum emission was emitted.

4.4 Test Receiver Setup

According to EN61000-6-3 rules, the frequency was investigated from 30 to 1000 MHz. During the radiated emission test, the test receiver was set with the following configurations:

Test Receiver Setting:

Detector.....Peak & Quasi-Peak
 IF Band Width.....120KHz
 Frequency Range.....30MHz to 1000MHz
 Turntable Rotated.....0 to 360 degrees

Antenna Position:

Height.....1m to 4m
 Polarity.....Horizontal and Vertical



4.5 Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -10 dB μ V of specification limits), and are distinguished with a "QP" in the data table.

4.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB μ V means the emission is 7dB μ V below the maximum limit for Class A. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Class A Limit} - \text{Corr. Ampl.}$$

4.7 Radiated Disturbances Test Result

Temperature (°C)	15~35
Humidity (%RH)	30~60
Barometric Pressure (mbar)	860~1060
EUT	laser machine
M/N	TBK958A
Operating Mode	ON

Test data see following pages

4.8 Test Equipment List and Details

No.	Instrument no.	Equipment	Manufacturer	Model No.	S/N	Last Calculator	Due Calculator
1	BCT-EMC001	EMI Test Receiver	R&S	ESCI	100687	2021-03-12	2022-03-11
2	BCT-EMC002	EMI Test Receiver	R&S	ESPI	100097	2021-03-12	2022-03-11
3	BCT-EMC018	TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB9163	9163-324	2021-03-12	2022-03-11

Note: Due to EUT emission source below 108MHz, there is no need for determination of 1GHz.

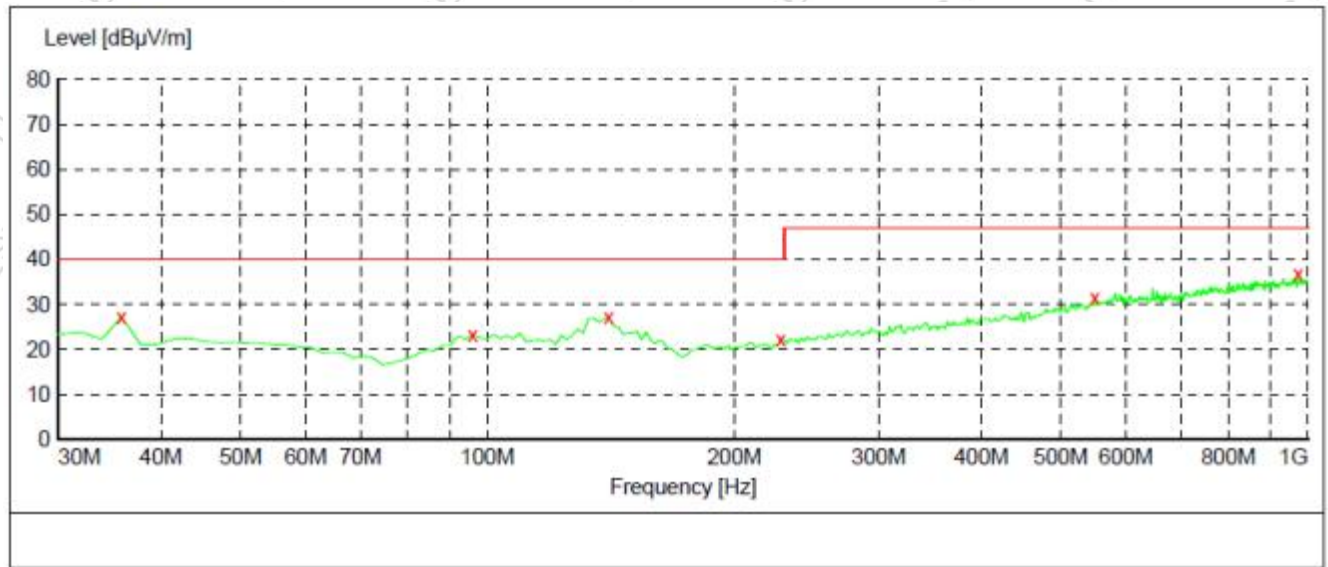
4.9 Test Result

PASS



Radiated Disturbances Test Data

EUT: laser machine M/N: TBK958A
 Operating Condition: ON
 Test Site: Shielded Room
 Operator: Eric
 Test Specification: 230V AC
 Comment: Live Line Tem:26°C Hum:60%

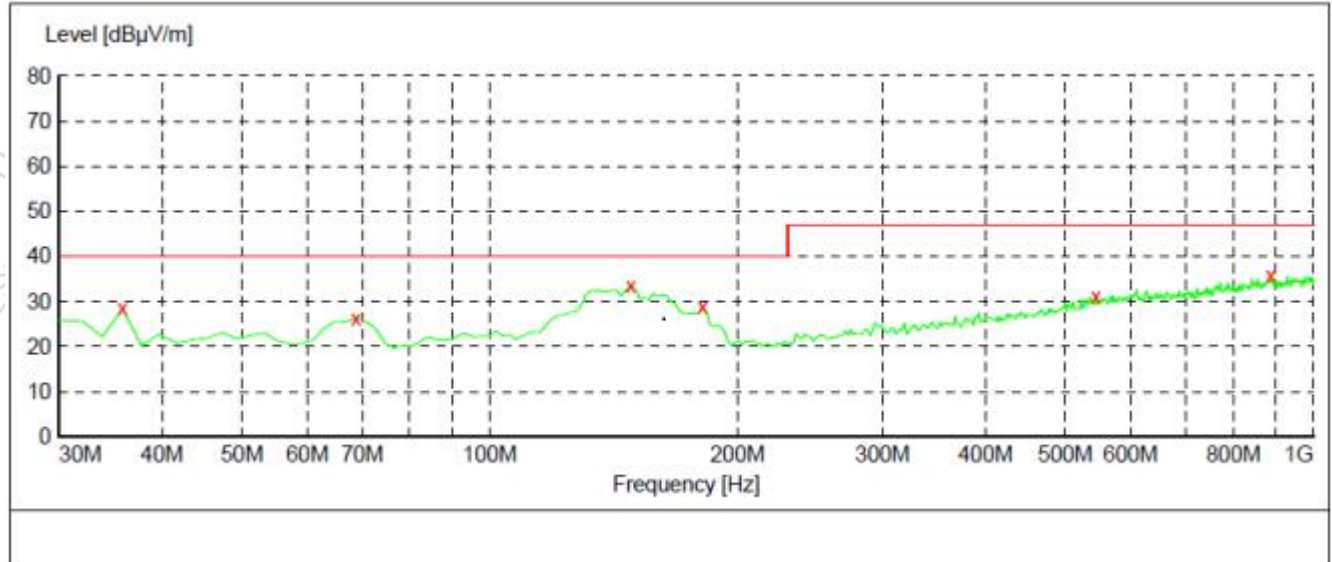


Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
35.820000	27.20	14.7	40.0	12.8	---	300.0	0.00	HORIZONTAL
95.960000	23.20	17.2	40.0	16.8	---	100.0	0.00	HORIZONTAL
140.580000	27.20	12.3	40.0	12.8	---	300.0	0.00	HORIZONTAL
227.880000	22.20	16.0	40.0	17.8	---	300.0	0.00	HORIZONTAL
549.920000	31.50	25.0	47.0	15.5	---	300.0	0.00	HORIZONTAL
972.840000	36.70	29.7	47.0	10.3	---	300.0	0.00	HORIZONTAL



Radiated Emission Test Data

EUT: laser machine M/N: TBK958A
 Operating Condition: ON
 Test Site: Shielded Room
 Operator: Eric
 Test Specification: 230V AC
 Comment: Live Line Tem:26°C Hum:60%

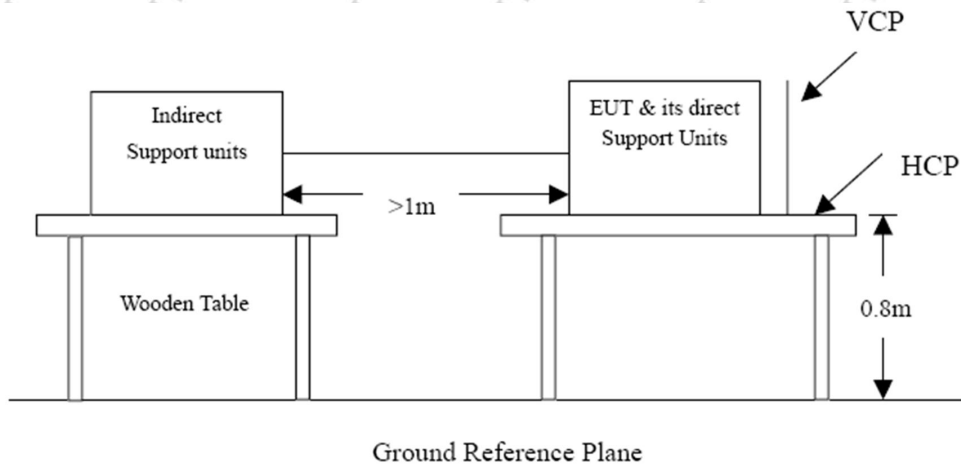


Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
35.820000	28.50	14.7	40.0	11.5	---	100.0	0.00	VERTICAL
68.800000	26.40	12.7	40.0	13.6	---	100.0	0.00	VERTICAL
148.340000	33.50	12.3	40.0	6.5	---	100.0	0.00	VERTICAL
181.320000	28.80	14.0	40.0	11.2	---	100.0	0.00	VERTICAL
544.100000	31.20	24.9	47.0	15.8	---	100.0	0.00	VERTICAL
887.480000	35.70	29.1	47.0	11.3	---	100.0	0.00	VERTICAL



5 - ELECTROSTATIC DISCHARGE IMMUNITY TEST

5.1 Block Diagram of Test Setup



5.2 Test Standard

EN IEC 61000-6-2:2019 (EN61000-4-2:2009 Severity Level: 3 / Air Discharge: $\pm 8\text{KV}$ Level: 2 / Contact Discharge: $\pm 4\text{KV}$)

5.3 Severity Levels and Performance Criterion

5.3.1 Severity level

Level	Test Voltage Contact Discharge (KV)	Test Voltage Air Discharge (KV)
1.	± 2	± 2
2.	± 4	± 4
3.	± 6	± 8
4.	± 8	± 15
X	Special	Special

5.3.2 Performance criterion: B

5.4 Operating Condition of EUT

5.4.1 Setup the EUT as shown on Section 5.1.

5.4.2 Turn on the power of all equipments.

5.4.3 Let the EUT work in measuring mode (Normal operation) and measure it.

5.5 Test Procedure

5.5.1 Air Discharge:

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This test is done on a non-conductive surface. The round discharge tip of the discharge electrode shall be approached as fast as possible to touch the EUT. After each discharge, the discharge electrode shall be removed from the EUT. The generator is then re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure shall be repeated until all the air discharge completed.

5.5.2 Contact Discharge:

All the procedure shall be same as Section 5.5.1. Except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

5.5.3 Indirect discharge for horizontal coupling plane

At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge.

5.5.4 Indirect discharge for vertical coupling plane

At least 10 single discharge (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, is placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges shall be applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.

5.6 Test Equipment List and Details

No.	Instrument no.	Equipment	Manufacturer	Model No.	S/N	Last Calculator	Due Calculator
1	BCT-EMC008	Electrostatic Discharge Simulator	TESEQ	NSG437	125	2021-03-12	2022-03-11

5.7 Test Results

PASS

Temperature (°C)	22~24
Humidity (%RH)	50~55
Barometric Pressure (mbar)	950~1000
EUT	laser machine
M/N	TBK958A
Operating Mode	Normal operation

Please refer to the following pages



Table 1: Electrostatic Discharge Immunity (Air Discharge)

EN 61000-4-2 Test Points	Test Levels									
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	-15 kV	+15 kV
Gap	A	A	A	A	A	A	A	A	/	/
Shell	A	A	A	A	A	A	A	A	/	/
Screw	A	A	A	A	A	A	A	A	/	/
Others	A	A	A	A	A	A	A	A	/	/

Table 2: Electrostatic Discharge Immunity (Direct Contact)

EN 61000-4-2 Test Points	Test Levels									
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	-15 kV	+15 kV
Metal	A	A	A	A	/	/	/	/	/	/
Others	A	A	A	A	/	/	/	/	/	/

Table 3: Electrostatic Discharge Immunity (Indirect Contact HCP)

EN 61000-4-2 Test Points	Test Levels									
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	-15 kV	+15 kV
Front Side	A	A	A	A	/	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/	/
Right Side	A	A	A	A	/	/	/	/	/	/

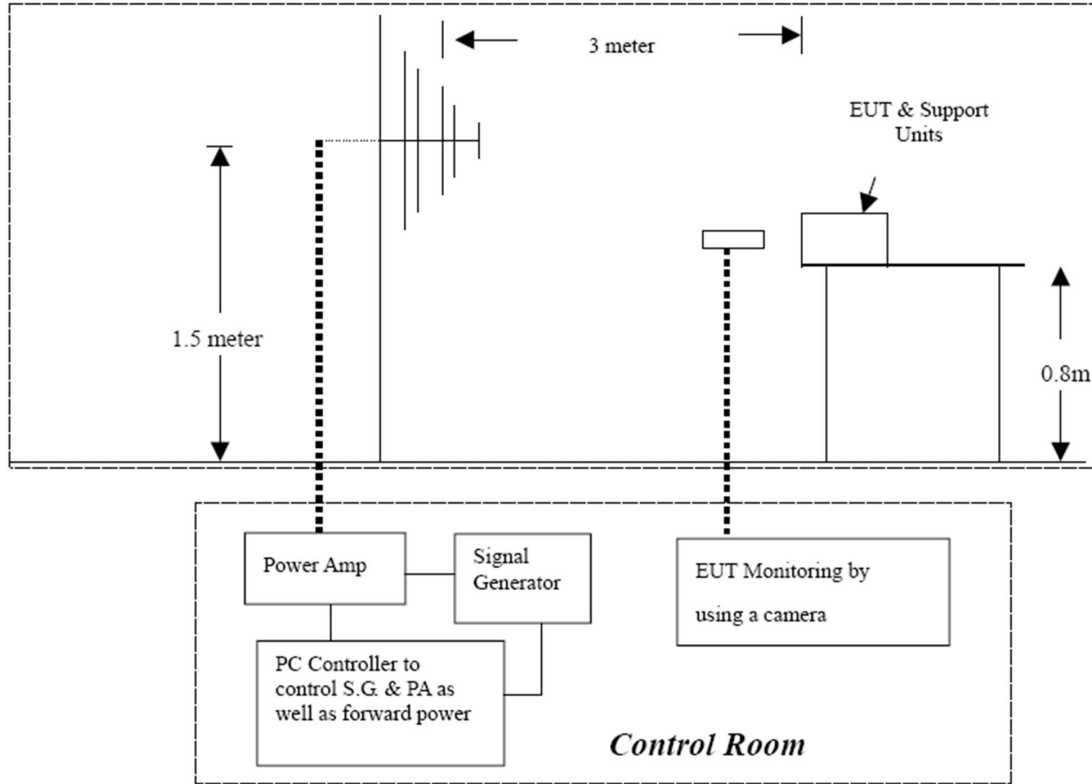
Table 4: Electrostatic Discharge Immunity (Indirect Contact VCP)

EN 61000-4-2 Test Points	Test Levels									
	-2 kV	+2 kV	-4 kV	+4 kV	-6 kV	+6 kV	-8 kV	+8 kV	-15 kV	+15 kV
Front Side	A	A	A	A	/	/	/	/	/	/
Back Side	A	A	A	A	/	/	/	/	/	/
Left Side	A	A	A	A	/	/	/	/	/	/
Right Side	A	A	A	A	/	/	/	/	/	/



6 - RF FIELD STRENGTH SUSCEPTIBILITY TEST

6.1 Block Diagram of Test



6.2 Test Standard

EN IEC 61000-6-2:2019 (EN61000-4-3:2006+A2:2010, Severity Level: 1, 1V / m Level: 2, 3V / m, Level: 3, 10V / m)

6.3 Severity Levels and Performance Criterion

6.3.1 Severity Levels

Level	Field Strength V/m
1.	1
2.	3
3.	10
X	Special

6.3.2 Performance Criterion: A



6.4 Operating Condition of EUT

6.4.1 Setup the EUT as shown on Section 6.1.

6.4.2 Turn on the power of all equipments.

6.4.3 Let the EUT work in measuring mode (Normal operation) and measure it..

6.5 Test Procedure

The EUT are placed on a table which is 0.8 meter high above the ground. The EUT is set 3 meters away from the transmitting antenna which is mounted on an antenna tower. Both horizontal and vertical polarization of the antenna are set on test. Each of the four sides of the EUT must be faced this transmitting antenna and measured individually.

In order to judge the EUT performance, a CCD camera is used to monitor its screen .

All the scanning conditions are as following:

Condition of Test	Remark
1. Fielded Strength	10V/m, 3V/m, 1V/m (Severity Level 3/ Level 2/ Level 1)
2. Radiated Signal	Modulated
3. Scanning Frequency	80-1000MHz 1400-2700MHz
4. Sweep time of radiated	0.0015 Decade/s
5. Dwell Time	1 Sec.

6.6 Test Equipment List and Details

No.	Equipment	Manufacturer	Model No.	S/N	Calibration Date	Next Calibration Date
1	3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	2021-3-12	2022-3-11
2	ESG Vector signal generators	Agilent	E4438C	MY45095744	2021-3-12	2022-3-11
3	Power Amplifier	AR	150W1000	0322288	2021-3-12	2022-3-11
4	Power Amplifier	AR	25S1G4A	0321112	2021-3-12	2022-3-11
5	TRILOG Broadband Antenna	schwarzbeck	VULB 9136	401	2021-3-12	2022-3-11
6	Horn Antenna	ETS-LINGREN	3117	00057407	2021-3-12	2022-3-11
7	3M Chamber & Accessory Equipment	ETS-LINDGREN	FACT-3	3510	2021-3-12	2022-3-11
8	Spectrum Analyzer	Agilent	E4440A	MY46185649	2021-3-12	2022-3-11
9	TRILOG Broadband Antenna	schwarzbeck	VULB 9136	401	2021-3-12	2022-3-11
10	Multi device Controller	ETS-LINGREN	2090	00057230	N/A	N/A
11	Horn Antenna	ETS-LINGREN	3117	00057407	2021-3-12	2022-3-11
12	Microwave Preamplifier	Agilent	8449B	3008A02425	2021-3-12	2022-3-11

6.7 Test Results

PASS



Please refer to the following page.

Temperature (°C)	22~24
Humidity (%RH)	50~55
Barometric Pressure (mbar)	950~1000
EUT	laser machine
M/N	TBK958A
Operating Mode	Normal operation

Frequency Range (MHz)	Front (10 V/m)		Rear (10 V/m)		Left Side (10 V/m)		Right Side (10 V/m)	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
80-1000	A	A	A	A	A	A	A	A

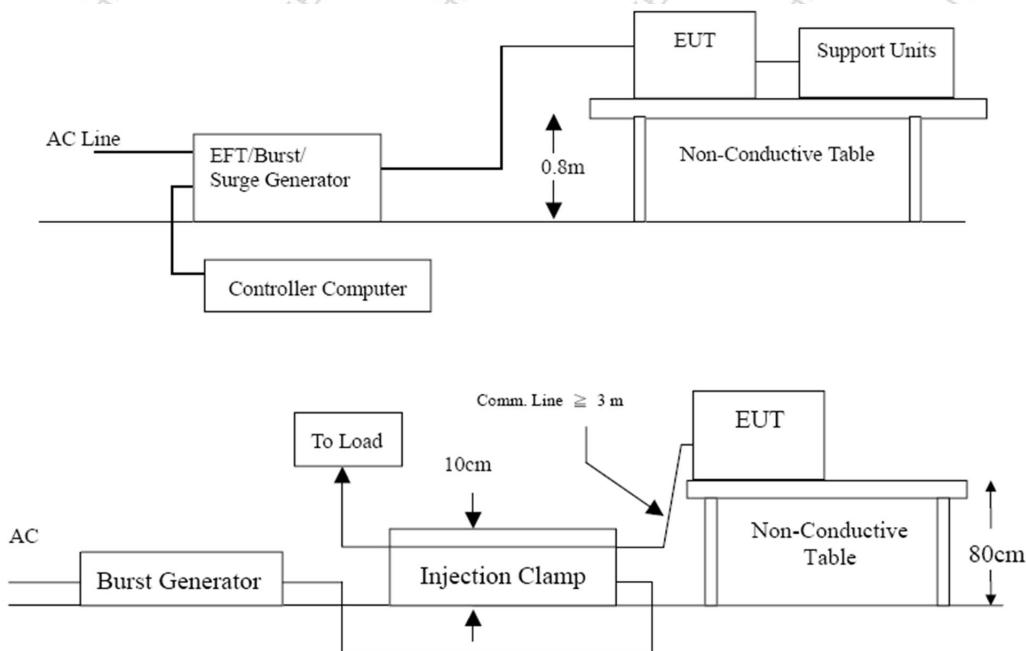
Frequency Range (MHz)	Front (3 V/m)		Rear (3 V/m)		Left Side (3 V/m)		Right Side (3 V/m)	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
1400-2000	A	A	A	A	A	A	A	A

Frequency Range (MHz)	Front (1 V/m)		Rear (1 V/m)		Left Side (1 V/m)		Right Side (1 V/m)	
	VERT	HORI	VERT	HORI	VERT	HORI	VERT	HORI
2000-2700	A	A	A	A	A	A	A	A



7 - Electrical Fast Transient/Burst Immunity Test

7.1 Block Diagram of Test Setup



7.2 Test Standard

EN IEC 61000-6-2:2019, (EN61000-4-4:2012, Severity Level, Level 3:2KV)

7.3 Severity Levels and Performance Criterion

7.3.1 Severity level

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

7.3.2 Performance criterion: B



7.4 Operating Condition of EUT

7.4.1 Setup the EUT as shown in Section 117.1.

7.4.2 Turn on the power of all equipments.

7.4.3 Let the EUT work in test mode (Full loadNormal Operation) and measure it.

7.5 Test Procedure

The EUT is put on the table which is 0.8 meter high above the ground. This reference ground plane shall 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 beneath the EUT, shall be more than 0.5m.

7.5.1 For input and output AC power ports:

It's unnecessary to test

7.5.2 For signal lines and control lines ports:

It's unnecessary to test.

7.5.3 For DC Input line ports:

The EUT is connected to the DC power mains by using a coupling device which couples the EFT interference signal to DC power lines. Both polarities of the test voltage should be applied during compliance test and the duration of the test is 2 mins.

7.6 Test Equipment List and Details

No.	Instrument no.	Equipment	Manufacturer	Model No.	S/N	Calibration Date	Next Calibration Date
1	BCT-EMC009	Fast Transient Burst Generator	SCHAFFNER	MODULA6150	34572	2021-03-12	2022-03-11

7.7 Test Result

PASS

Please refer to the following page:



Temperature (°C)	22~24
Humidity (%RH)	50~55
Barometric Pressure (mbar)	950~1000
EUT	laser machine
M/N	TBK958A
Operating Mode	Normal operation

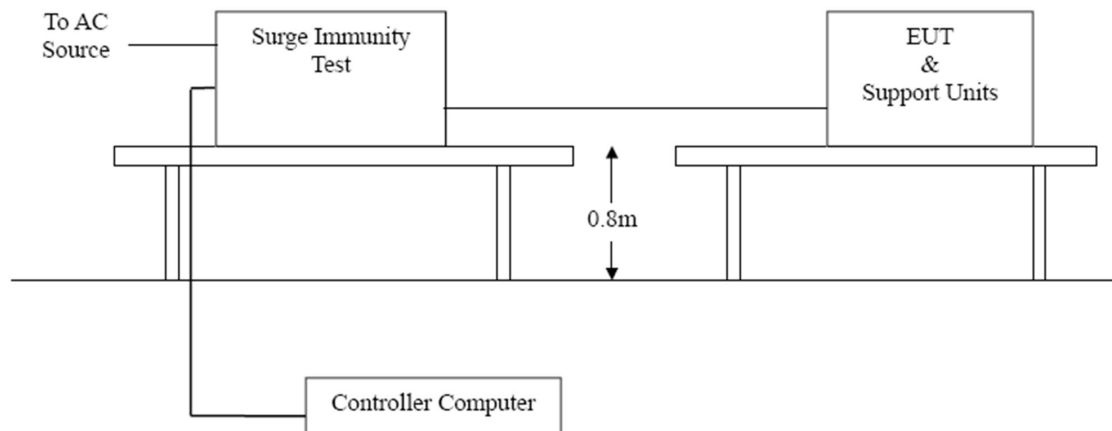
IEC 61000-4-4 Test Points		Test Levels (kV)							
		+0.5	-0.5	+1.0	-1.0	+2.0	-2.0	+4.0	-4.0
Power Supply	P	A	A	A	A	A	A	/	/
	N	A	A	A	A	A	A	/	/
	P+N	A	A	A	A	A	A	/	/
Power Line of EUT	P+PE	A	A	A	A	A	A	/	/
	N+PE	A	A	A	A	A	A	/	/
	P+N+PE	A	A	A	A	A	A	/	/

Note: P stands for positive line, N stands for negative line.



8 - Surge Immunity Test

8.1 Block Diagram of Test Setup



8.2 Test Standard

EN IEC 61000-6-2:2019, (IEC 61000-4-5:2014 Severity Level: Line to Line, Level 2: 1KV, Line to Earth , Level 3: 2KV)

8.3 Severity Levels and Performance Criterion

8.3.1 .Severity level

Severity Level	Open-Circuit Test Voltage KV
1	0.5
2	1.0
3	2.0
4	4.0
*	Special

8.3.2 Performance criterion : B

8.4 Operating Condition of EUT

8.4.1 Setup the EUT as shown in Section 28.1.

8.4.2. Turn on the power of all equipments.

8.4.3. Let the EUT work in test mode (Full load Normal operation) and measure it.



8.5 Test Procedure

- 1) Set up the EUT and test generator as shown on Section 8.1.
- 2) For AC port coupling mode, provide a 1 KV 1.2/50us voltage surge (at open-circuit condition) and 8/20us current surge to EUT selected points.
- 3) At least 5 positive and 5 negative (polarity) tests with a maximum 1/min repetition rate are conducted during test.
- 4) Record the EUT operating situation during compliance test and decide the EUT immunity criterion for above each test.

8.6 Test Result

PASS

Please refer to the following page.

Temperature (°C)	22~24
Humidity (%RH)	50~55
Barometric Pressure (mbar)	950~1000
EUT	laser machine
M/N	TBK958A
Operating Mode	Normal operation

Table 1: Surge Power Supply (DC POWER SUPPLY Power Line of EUT)

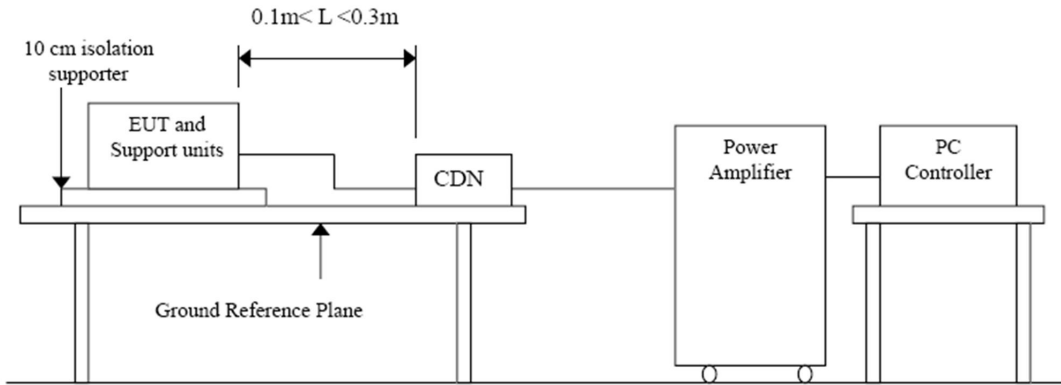
Level	Voltage	Poll	Path	Pass	Fail
1	0.5kV	±	P-N	A	/
2	1kV	±	P-N	A	/
3	2kV	±	P-PE, N-PE	A	/
4	4kV	±	P-N, P-PE, N-PE	A	/

Note: P stands for positive line, N stands for negative line.



9 - Conducted Susceptibility Test

9.1 Block Diagram of Test Setup



9.2 Test Standard

EN IEC 61000-6-2:2019 (EN 61000-4-6:2014, Severity Level 3: 10V (rms)).(0.15MHz ~ 80MHz)

9.3 Severity Levels and Performance Criterion

9.3.1 Severity level

Level	Field Strength V(rms)
1.	1
2.	3
3.	10
X	Special

9.3.2 Performance criterion: A

9.4 Operating Condition of EUT

9.4.1 Setup the EUT as shown in Section 38.1.

9.4.2 Turn on the power of all equipments.

9.4.3 Let the EUT work in test mode (Full load Normal operation) and measure it.

9.5 Test Procedure

9.5.1 For AC Input line ports:

It's unnecessary to test.

9.5.2 For signal lines and control lines ports:



It's unnecessary to test.

9.5.3 For DC Mains:

- 1) Set up the EUT, CDN and test generators as shown on Section 8.1.
- 2) Let the EUT work in test mode and measure it.
- 3) The EUT are placed on an insulating support 0.1m high above a ground reference plane. CDN (coupling and decoupling network) is placed on the ground plane about 0.3m from EUT. Cables between CDN and EUT are as short as possible, and their height above the ground reference plane shall be between 30 and 50 mm (where possible).
- 4) The disturbance signal described below is injected to EUT through CDN.
- 5) The EUT operates within its operational mode(s) under intended climatic conditions after power on.
- 6) The frequency range is swept from 150KHz to 80MHz using 3V signal level, and with the disturbance signal 80% amplitude modulated with a 1KHz sine wave.
- 7) The rate of sweep shall not exceed 1.5×10^{-3} decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.

Recording the EUT operating situation during compliance testing and decide the EUT immunity criterion.

9.6 Test Results

PASS

Please refer to the following page.

Frequency Range (MHz): 0.15~80MHz
 Modulation: Amplitude 80%, 1kHz sinewave
 Severity Level: 10Vr.m.s.

Temperature (°C)	22~24
Humidity (%RH)	50~55
Barometric Pressure (mbar)	950~1000
EUT	laser machine
M/N	TBK958A
Operating Mode	Normal operation

Level	Voltage Level (e.m.f.) U ₀	Pass	Fail
1	1	/	/
2	3	/	/
3	10	A	/
X	Special	/	/

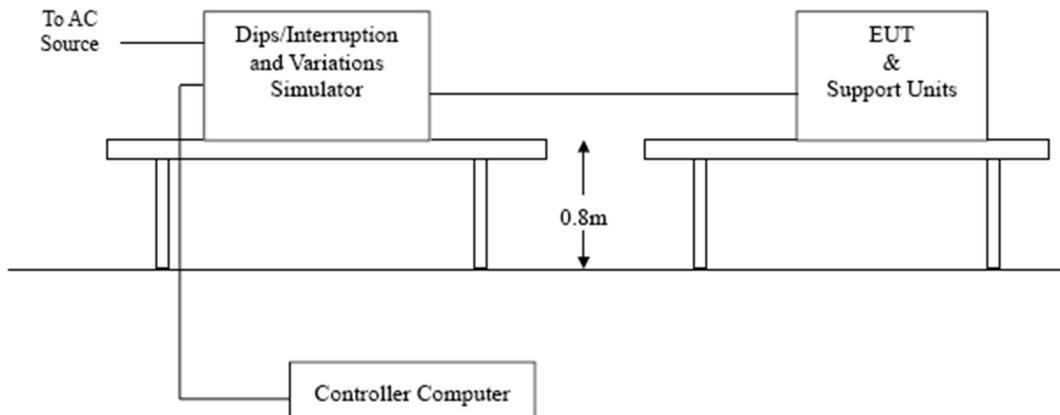


10 - Voltage Dips, Short Interruptions Immunity Tests

10.1 Test Specification

Basic Standard:	IEC/EN 61000-4-11
Test Level:	Voltage Dips: 1) 0% residual voltage for 0.5 cycle, 2) 70% residual voltage for 25 cycles, Voltage Interruptions:0% residual voltage for 250 cycles
Interval between event:	10 seconds
Phase Angle:	0°/180°
Test cycle:	3 times
Temperature:	22~23 (°C)
Humidity:	50~54 (%RH)
Barometric Pressure:	950~1000 (mbar)
Operating Mode:	Normal Operation

10.2 Test Setup





10.3 Test Procedure

The EUT was tested for each selected combination of test levels and duration with a sequence of 3 dips/interruptions with intervals of 10s (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.

10.4 Test Equipment List and Details

No.	Instrument no.	Equipment	Manufacturer	Model No.	S/N	Last Calculator	Due Calculator
1	BCT-EMC009	Fast Transient Burst Generator	SCHAFFNER	MODULA6150	34572	2021-03-12	2022-03-11

10.5 Performance Criterion Required & Test Result

Voltage (% Residual)	Duration (Period)	Observation Performance	Criterion Required
0	0.5	A	B
70	25	B	C
0	250	C	C

Test Result: Pass



11 - TEST RESULTS

11.1 EN 61000-4-2 Electrostatic Discharge Immunity Test Configuration

The EUT was subjected to the electrostatic discharge tests required by EN 61000-6-1 and all lower levels specified in EN 61000-4-2.

The EUT continued to perform as intended during and after the application of the ESD. Test setup photographs presented in Appendix B.

11.2 EN 61000-4-3 Radiated Susceptibility Test Configuration

The EUT was subjected to a 3-volt/meter, 80% Amplitude, 1 kHz Sine wave field as required by EN 61000-6-1 and all lower levels specified in EN 61000-4-3.

The EUT continued to perform as intended during and after the application of the electromagnetic field. Test setup photographs presented in Appendix B.

11.3 EN 61000-4-4 Electrical Fast Transient/Burst Immunity Test Configuration

The EUT was subjected to the electrical fast transient tests required by EN IEC 61000-6-2:2019 and all lower levels specified in EN 61000-4-4.

The EUT continued to perform as intended during and after the application of the EFT/B. Test setup photographs presented in Appendix B.

11.4 EN 61000-4-5 Surge Immunity Test Configuration

The EUT was subjected to the Surge Immunity tests required by EN IEC 61000-6-2:2019 and all lower levels specified in EN 61000-4-5.

The EUT continued to perform as intended during and after the application of the Surge Immunity Test. Test setup photographs presented in Appendix B.

11.5 EN 61000-4-6 Conducted Susceptibility Test Configuration

The EUT was subjected to the Conducted Susceptibility tests required by EN IEC 61000-6-2:2019 and all lower levels specified in EN 61000-4-6.

The EUT continued to perform as intended during and after the application of the Conducted Susceptibility Test. Test setup photographs presented in Appendix B.



APPENDIX A - EUT PHOTOGRAPHS







*****END OF THE REPORT*****