

EMC TEST REPORT

Product Name Thermoelectric cooling module

Trade mark /

Model No. TEC1-12706T125, Additional models refer to see page 3.

Report No. CTB220525015EX

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Date of Receipt 2022-05-19

Date of Test(s) 2022-05-20 ~ 2022-05-25

Date of Issue 2022-05-26

Test Standard(s) EN IEC 55014-1:2021, EN IEC 55014-2:2021

Test Result: Pass

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

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Approved by:



Note: The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report shall not be reproduced except in full, without prior written approval of CTB. This document may be altered or revised by CTB, personnel only, and shall be noted in the revision of the document.

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1. Description of version

Report No.	Issue Date	Description	Approved
CTB220525015EX	2022-05-26	Original	Valid

Series models are as follows:

TEC1-07104T125, TEC1-28720T200, TEC2-25407T125, TES1-03103T125, TEC1-24118T200, TES1-3202T125, TEC1-12708T125, TEC1-12704T125, TES1-06304T125, TEC1-12712T125, TES1-04702T125, TEC1-07106T125, TES1-04903T125, TES1-12703T125, TEC1-07103T125, TES1-071035T125, TES1-01201A, TEC1-12703T125, TEC1-12705T125, TEC1-12708T125, TEC1-12709T125, TEC1-12715T125, TES1-12702T125, TES1-12704T125, TES1-12705125, TEC1-07109T125, TEC1-04715T125, TEC2-25406T125, TEC2-25408T125, TEC2-25405T125, TEC3-22903T125, TEC1-09515T125, TES1-06302T125, TEC1-12706T200, TEC1-12706T150, TES1-1702T125, TES1-3101T125, TEG1-127-2.8-1.6T250HP, TEC4-24606T125TEC1-16108T125, TEC1-16115T125, TEC1-12724T125, TEC1-19928T125

2. Test summary

Emission		
Test item	Test Method	Result
Continuous disturbance	EN IEC 55014-1	N/A ¹
Discontinuous disturbance		N/A ²
Magnetic field strength		N/A ³
Disturbance power		N/A
Radiated emission		PASS
Immunity(EN IEC 55014-2)		
Test item	Test Method	Result
Electrostatic discharges	IEC 61000-4-2	PASS
Fast transients	IEC 61000-4-4	N/A ¹
Injected currents	IEC 61000-4-6	N/A ¹
Radio frequency electromagnetic field	IEC 61000-4-3	PASS
Surges	IEC 61000-4-5	N/A ¹
Voltage dips	IEC 61000-4-11	N/A ¹

Note: N/A is abbreviation for Not Applicable.

1. The Product is powered by DC power, this test items is not applicable.
2. The Product has no switching operations, automatic programme or other electrically controlled or operated functions
3. It only apply to induction cooking appliances.

3. Measurement uncertainty

The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard

Test item	Frequency	Expanded Uncertainty (U_{Lab})
Conducted Emission	150 kHz to 30 MHz	± 3.2 dB
Disturbance power	30 MHz to 300 MHz	± 3.7 dB
Magnetic field strength	9 kHz-30 MHz	± 2.8 dB
Radiated Emission	30 MHz to 1000 MHz	± 4.8 dB

uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95 %

4. General information

4.1. Description of EUT

Product name	Thermoelectric cooling module
Trade Mark	/
Model	TEC1-12706T125
Serial No.	Additional models refer to see page 3.
Model Difference	All model's the function, software and electric circuit are the same. Only with a product color, shape and model named different. Test Sample Model : TEC1-12706T125.
Rated Power	52W
Rated Voltage& current	DC12V
Category	<input type="checkbox"/> I <input type="checkbox"/> II <input checked="" type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V
The highest frequency of the internal sources of the EUT :	<input checked="" type="checkbox"/> less than 108 MHz, the measurement shall only be made up to 1 GHz. <input type="checkbox"/> between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. <input type="checkbox"/> between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz. <input type="checkbox"/> above 1 GHz, the measurement shall be made up to 6 GHz.
Configuration	<input checked="" type="checkbox"/> Table-top <input type="checkbox"/> Floor-standing
Adapter Information:	/

Note: The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

4.2. Description of Accessory Device

No.	Device Type	Brand	Model	Specification	Note
1.	DC Power	LONGWEI	TPR-12002D	/	/

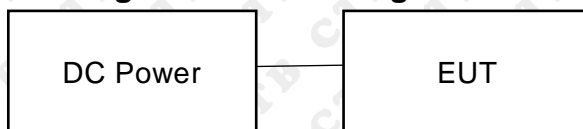
4.3. Test conditions

Temperature: 15-25°C

Relative Humidity: 30-60 %

Atmospheric pressure: 800hPa-1060hPa

4.4. Block diagram of EUT configuration



4.5. Operating condition of EUT

Operating condition	Mode 1*	Working	Test Voltage	DC12V
Note: This test covers all possible operating modes of the device, only the worst data are list in report. The worst data are shows (*) is the nearest standard limit which were recorded in this report.				

5. List of test and measurement instruments

Radiated emission					
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	1911	2022.08.07
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	869	2022.08.07
3	Amplifier	Agilent	8449B	3008A01838	2022.08.05
4	Amplifier	HP	8447E	2945A02747	2022.08.05
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI7	100362	2022.08.05
6	Coaxial cable	ETS	RFC-SNS-100 -NMS-80 NI	/	2022.08.05
7	Coaxial cable	ETS	RFC-SNS-100 -NMS-20 NI	/	2022.08.05
8	Coaxial cable	ETS	RFC-SNS-100 -SMS-20 NI	/	2022.08.05
9	Coaxial cable	ETS	RFC-NNS-10 0-NMS-300 NI	/	2022.08.05
10	EZ-EMC	Frad	EMC-con3A1. 1	/	/

Electrostatic discharges					
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	ESD Simulator	TESTQ	NSG437	329	2022.08.07

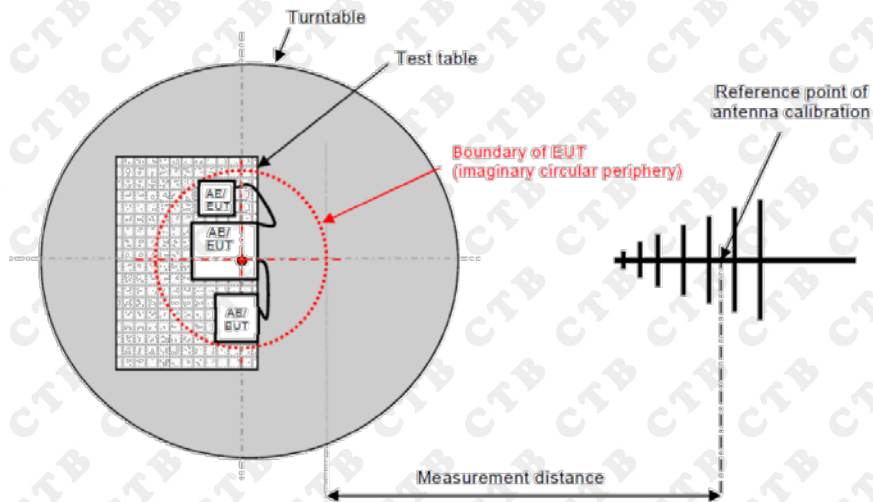
Radio frequency electromagnetic field					
No.	Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Signal Generator	Agilent	N5181A	2106070101	2022.08.16
2	Stacked Double Log.-Per. Antenna	SKET	STLP 9129 Plus	2106070106	2022.08.16
3	Switch Controller	SKET	RFSU-DC18 G-4C	2106070105	2022.08.16
4	RF Power Meter	Agilent	U2001	2106070102	2022.08.16
5	E-Field Probe	Narda	EP-601	2106070107	2022.08.16
6	Power Amplifier	SKET	HAP-80M01G -250W	2106070103	2022.08.16
7	Power Amplifier	SKET	HAP-01G 06G-75W	2106070104	2022.08.16
8	Audio Analysis	R&S	UPV	2106070116	2022.08.16
9	Audio Output Matching Network	SKET	RCO Network	2106070117	2022.08.16
10	EMC-S Test software	SKET	V2.0.0.19	/	/

6. Emission

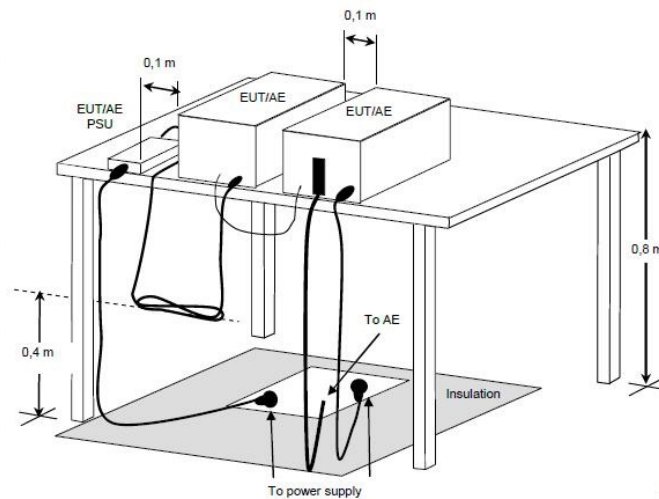
6.1. Radiated emission

6.1.1. Block diagram of test setup

Measurement distance



For table-top equipment



6.1.2. Limit

Up to 1GHz:

Frequency range MHz	Measurement			Limits dB(μ V/m)
	Facility	Distance m	Detector type / bandwidth	
30 to 230	SAC	3	Quasi Peak / 120 kHz	40
230 to 1 000				47

Above 1GHz:

Frequency range MHz	Measurement			Class B limits dB(μ V/m)
	Facility	Distance m	Detector type / bandwidth	
1 000 to 3 000	FSOATS	3	Average / 1MHz	50
3 000 to 6 000				54
1 000 to 3 000		3	Peak / 1MHz	70
3 000 to 6 000				74

6.1.3. Test procedure

1. The EUT is placed on a turn table which is 0,8/0,1 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The Boundary of EUT (imaginary circular periphery) is set 3 meters away from the receiving antenna (Reference point of antenna calibration) which is mounted on an antenna tower. The antenna can move up and down between 1 to 4 meters to find out the maximum emission level. Broadband antennas (calibrated by dipole antenna) are used as a receiving antenna.
2. Both horizontal and vertical polarizations of the antenna are set on test.
3. The bandwidth setting on the test receiver (R&S ESPI) reference 5.3.2.
4. The EUT is tested in Semi-Anechoic Chamber.
5. The Test results are listed in Section 5.3.4.

6.1.4. Test results

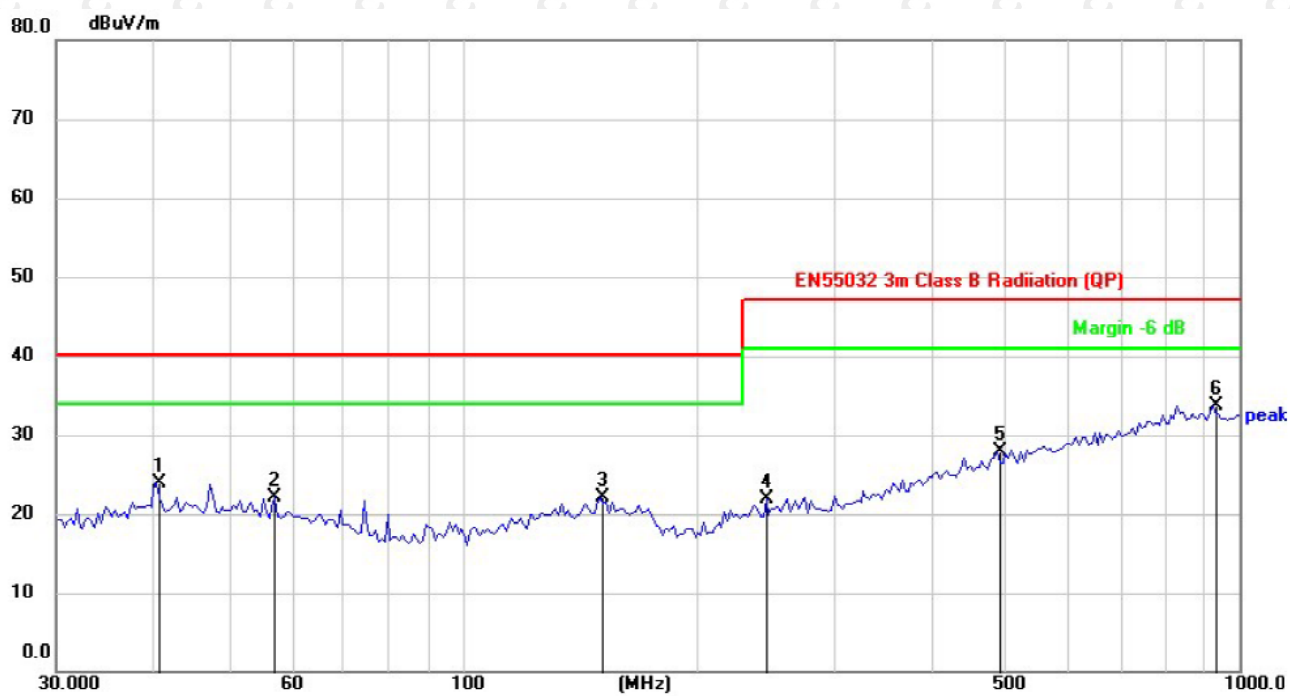
Temperature:	23°C	Relative Humidity:	54 %
Pressure:	101kPa	Polarization :	Horizontal
Test Voltage :	DC12V	Test Mode:	Mode 1



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		38.6839	27.58	-5.59	21.99	40.00	-18.01	QP
2		74.6569	31.99	-8.78	23.21	40.00	-16.79	QP
3		171.6933	28.44	-6.43	22.01	40.00	-17.99	QP
4		306.2164	35.31	-5.00	30.31	47.00	-16.69	QP
5		580.7026	26.98	2.21	29.19	47.00	-17.81	QP
6	*	884.5029	28.30	6.18	34.48	47.00	-12.52	QP

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

Temperature:	23°C	Relative Humidity:	54 %
Pressure:	101kPa	Polarization :	Vertical
Test Voltage :	DC12V	Test Mode:	Mode 1



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		40.4172	29.28	-5.29	23.99	40.00	-16.01	QP
2		57.3923	28.12	-6.03	22.09	40.00	-17.91	QP
3		150.5378	27.51	-5.50	22.01	40.00	-17.99	QP
4		245.9509	27.68	-5.74	21.94	47.00	-25.06	QP
5		487.3151	27.53	0.41	27.94	47.00	-19.06	QP
6	*	924.1346	27.66	6.06	33.72	47.00	-13.28	QP

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

7. Immunity

7.1. Performance criterion

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 manufacturer, 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 to persist after the test. 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 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.

7.2. Classification of apparatus

Category I: equipment containing no electronic control circuitry.

All appliances having no electronic control circuitry are considered to be category I.

Electric circuits consisting of passive components (such as radio interference suppression capacitors or inductors, mains transformers, mains frequency rectifiers and heating elements) are not considered to be electronic control circuitry.

Category II: mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz.

Test items:

Electrostatic discharges with performance criterion B;

Electric fast transients with performance criterion B;

Injected currents 150 kHz to 230 MHz with performance criterion A;

Surges with performance criterion B;

Voltage dips with performance criterion C.

Category III: battery operated equipment not included in Category I.

NOTE: The assignment to Category III is independent of the clock frequency

This category also includes equipment provided with rechargeable batteries, which can be

charged, directly or indirectly, from the mains. Accordingly, this equipment shall also be subjected to the test requirements for mains operated equipment but only when testing the charging function.

If the equipment can operate its intended functions when connected, directly or indirectly to the mains, then it is not battery operated. Accordingly, it shall be classified as Category II, Category IV or Category V, as applicable, and subjected to the corresponding test requirements when in mains operation.

Test items:

Electrostatic discharges with performance criterion B/C^a;

Electric fast transients with performance criterion B;

Injected currents 150 kHz to 80 MHz with performance criterion A;

Radio frequency electromagnetic fields ^{b, c} 80 MHz to (F) MHz with performance criterion A;

Surges with performance criterion B;

NOTE:

- a. Performance criterion C may be applied to toys not using score or data entered by the user (e.g. musical soft toys and sounding toys).
- b. The frequency (F), up to which this test needs to be performed, is determined from either categories IV test requirements or categories V test requirements, according to the principle for distinguishing between categories IV and V.
- c. For Category III toys, the radio frequency electromagnetic fields test shall be applicable only for ride on toys.

Category IV: mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 15 MHz but lower than or equal to 200 MHz.

Test items:

Electrostatic discharges with performance criterion B;

Electric fast transients with performance criterion B;

Injected currents 150 kHz to 80 MHz with performance criterion A;

Radio frequency electromagnetic fields 80 MHz to 1000 MHz with performance criterion A;

Surges with performance criterion B;

Voltage dips with performance criterion C.

Category V: mains operated equipment containing electronic control circuitry with a highest clock frequency greater than 200 MHz.

Test items:

Electrostatic discharges with performance criterion B;

Electric fast transients with performance criterion B;

Injected currents 150 kHz to 80 MHz with performance criterion A;

Radio frequency electromagnetic fields 80 MHz to 6000 MHz with performance criterion A;

Surges with performance criterion B;

Voltage dips with performance criterion C.

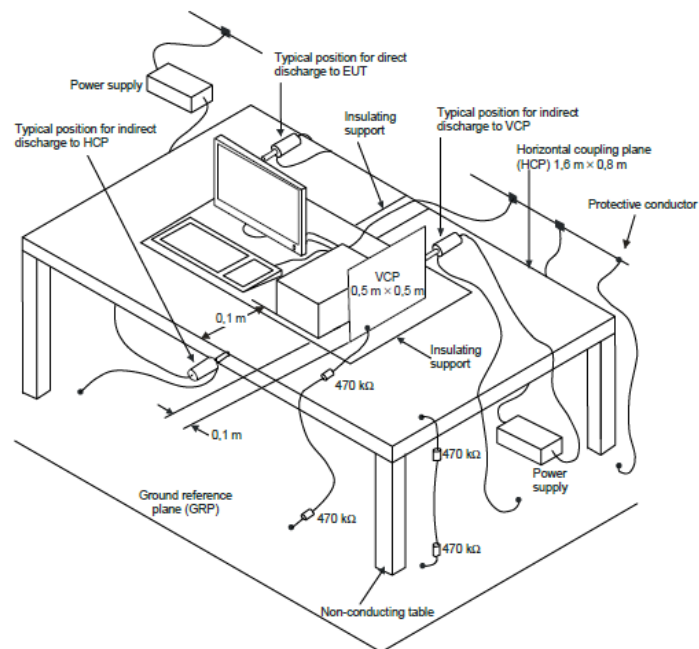
7.3. Electrostatic discharges

7.3.1. Test standard and Levels

Environmental phenomenon	Test specifications	Basic Standard
Electrostatic discharge	8 kV air discharge	IEC 61000-4-2
	4 kV contact discharge	

7.3.2. Block diagram of test setup

For table-top equipment



7.2.3. Test procedure

1. Air discharge:

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.

2. Contact discharge:

All the procedure shall be same as Section 1. except that the tip of the discharge electrode shall touch the EUT before the discharge switch is operated.

3. Indirect discharge for horizontal coupling plane

At least 20 single discharges shall be applied to the horizontal coupling plane, at points on each side of the EUT. The discharge electrode positions vertically at a distance of 0.1m from the EUT and with the discharge electrode touching the coupling plane.

4. Indirect discharge for vertical coupling plane

At least 20 single discharge 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.

7.3.4. Test results

Temperature:	23°C	Relative Humidity:	54 %
Pressure:	101kPa	Test Mode:	Mode 1
Test Voltage :	DC12V		

Discharge Method	Discharge Position	Voltage (±kV)	Min. No. of Discharge per polarity (Each Point)	Required Criterion	Performance Criterion
Contact Discharge	Conductive Surfaces	4	10	B	A
	Indirect Discharge HCP	4	10	B	A
	Indirect Discharge VCP	4	10	B	A
Air Discharge	Slots, Apertures, and Insulating Surfaces	8	10	B	A
Note*: N/A					

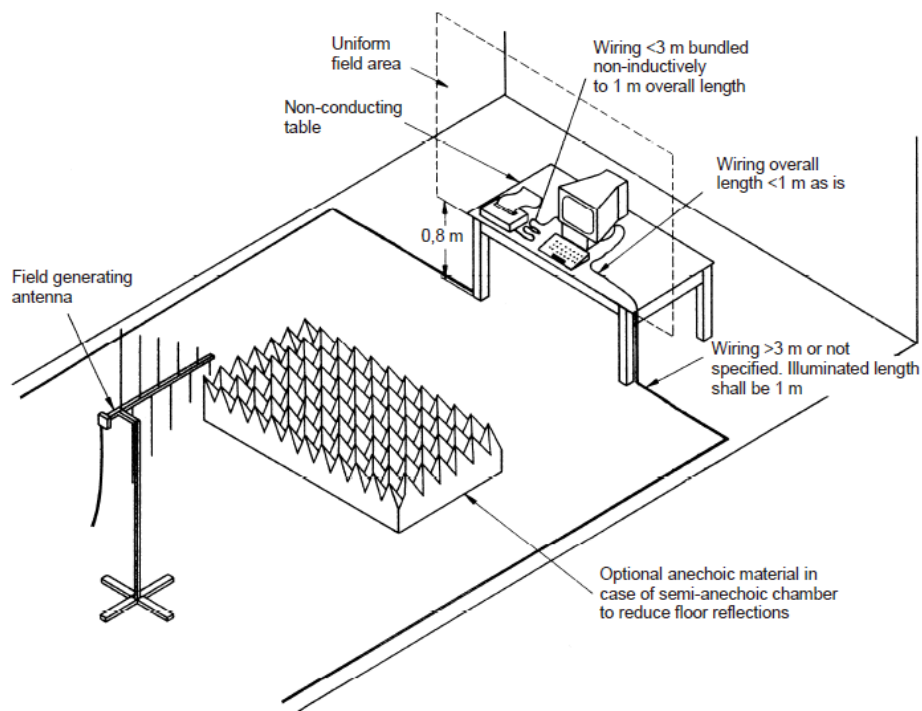
7.4. Radio frequency electromagnetic fields

7.4.1. Test standard and Levels and Performance Criterion

Enclosure port		
Environmental phenomenon	Test specifications	Basic Standard
Radio-frequency electromagnetic field, 1 kHz, 80% AM	80 MHz to 1 000 MHz	IEC 61000-4-3
	3 V/m (unmodulated)	

7.4.2. Block diagram of test setup

For table-top equipment



7.4.3. Test procedure

1. The EUT and its simulators are placed on a turn table which is 0.8 meter 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 polarizations of the antenna are set on test.
2. Each of the four sides of EUT must be faced this transmitting antenna and measured individually.
3. In order to determine the performance of EUT, a CCD camera is used to monitor the EUT.

7.4.4. Test results

Temperature:	23°C	Relative Humidity:	54 %
Pressure:	101kPa	Test Mode:	Mode 1
Test Voltage :	DC12V		

Frequency range [MHz]	Test Level [V/m]	Polarization	EUT Face	Required Criterion	Performance Criterion	Results
80 to 1000	3	Horizontal & Vertical	Front/ Rear	A	A	PASS
			Right/ Left	A	A	PASS
			Top/ Underside	A	A	PASS
Note*: N/A						

8. Photographs of test setup

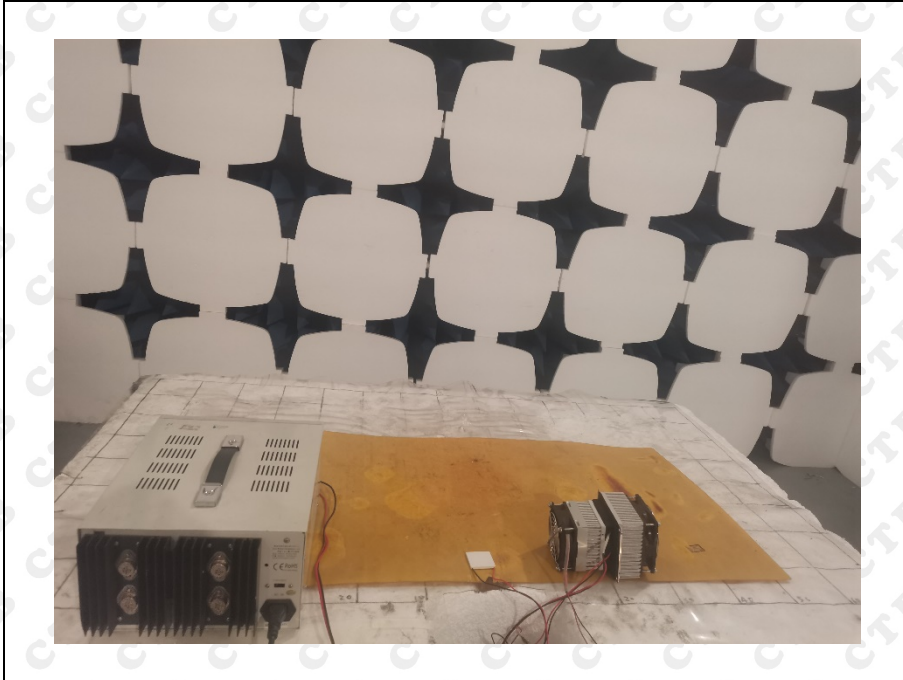
RE



ESD

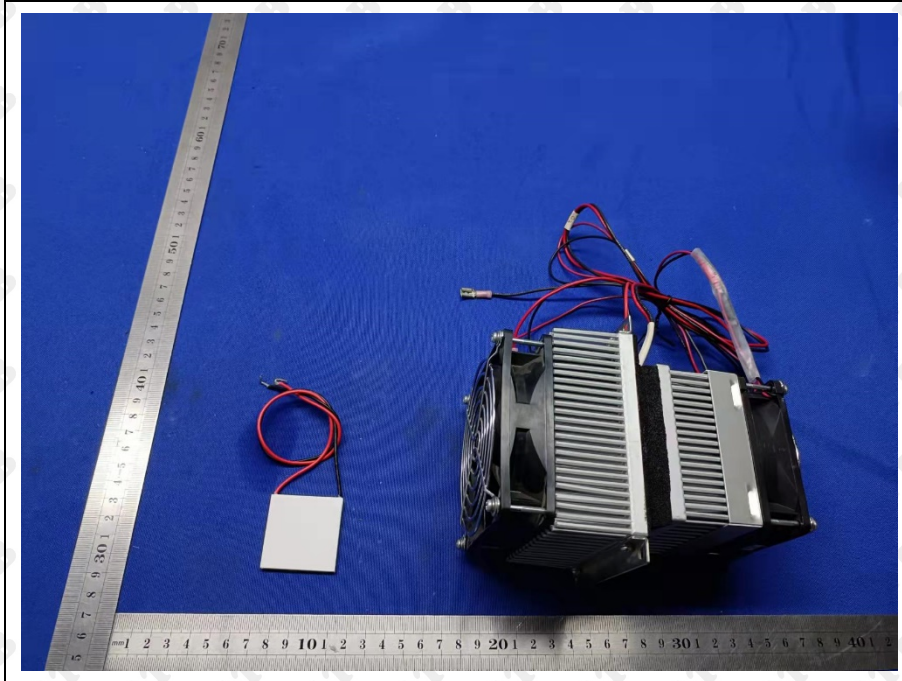


RS

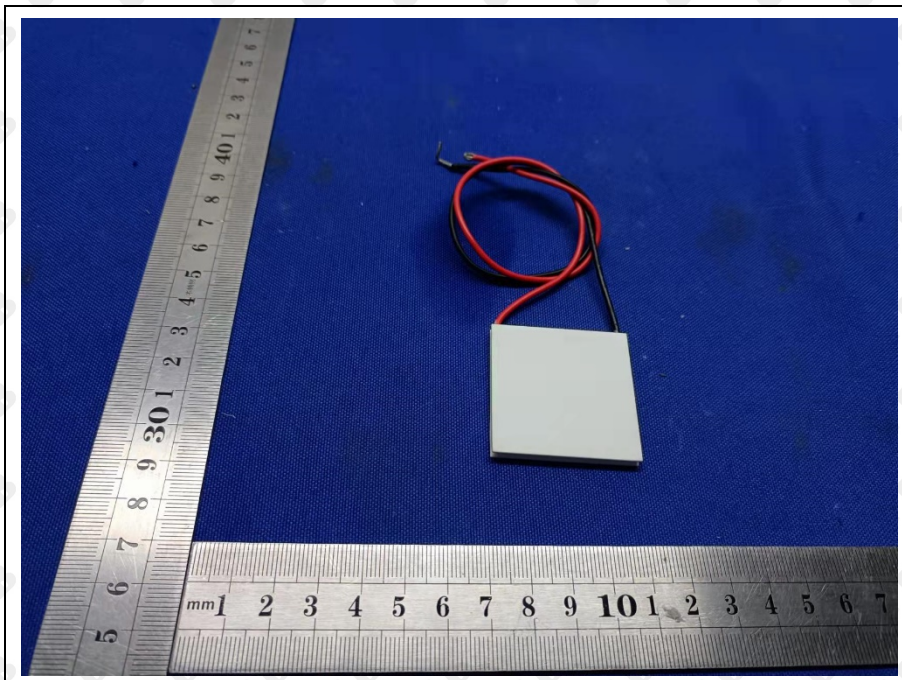


9. Photographs of EUT

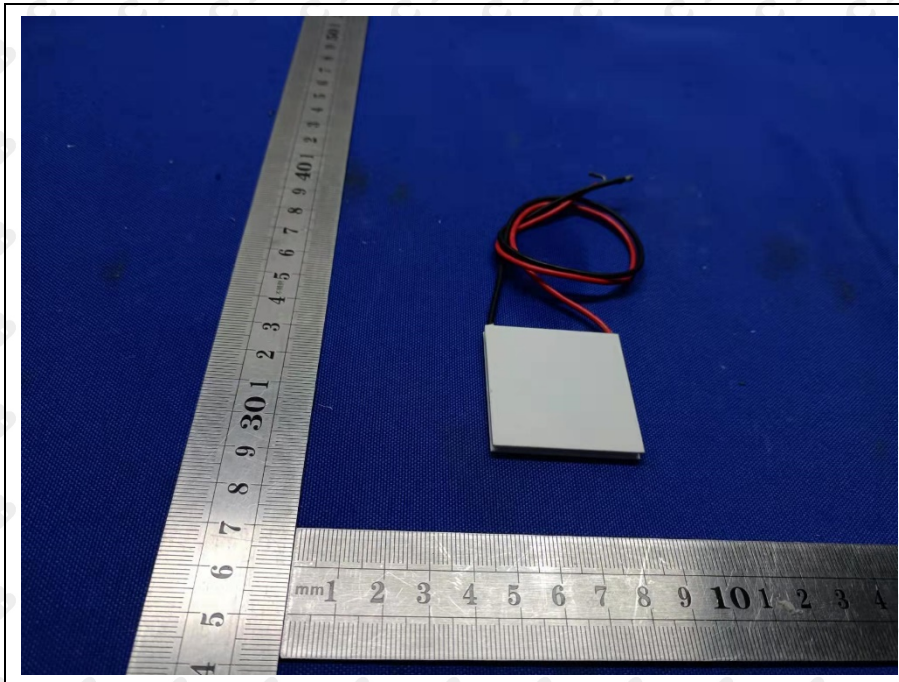
EUT photo 1



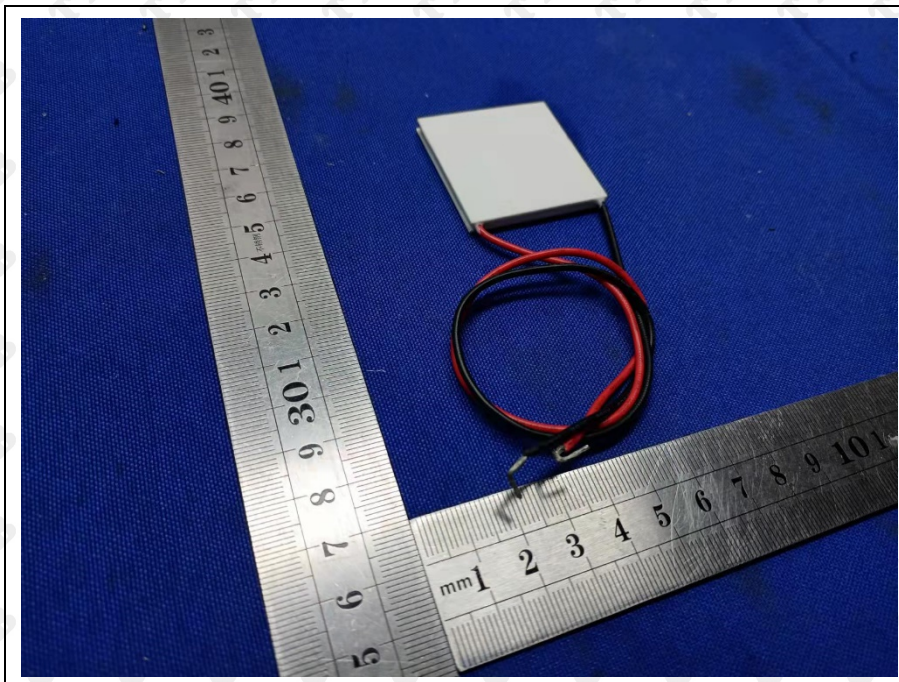
EUT photo 2



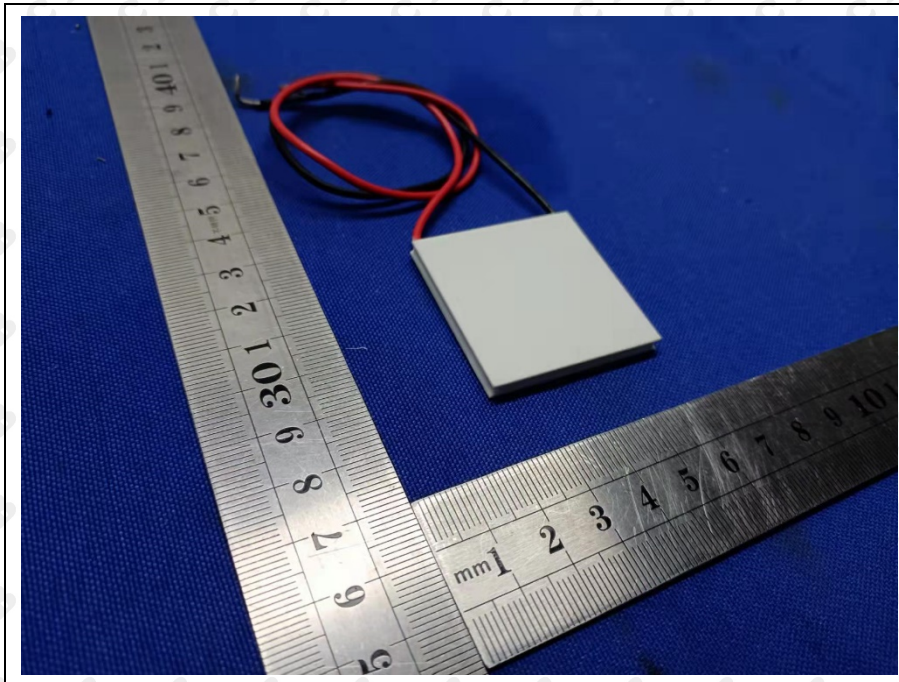
EUT photo 3



EUT photo 4



EUT photo 5



End of report