

# EMC Test Report

Applicant: Tangla lighting and living limited

Product: LED Rechargeable Lamps

Model: TL-RL-1001; TL-RL-1002; TL-RL-1003;  
TL-RL-1004; TL-RL-1006; TL-RL-1007;  
TL-RL-1008; TL-RL-1009; TL-RL-1010;  
TL-RL-1011; TL-RL-1012; TL-RL-1013;  
TL-RL-1014; TL-RL-1015; TL-RL-1016;  
TL-RL-1017; TL-RL-1018; TL-RL-1019;  
TL-RL-1020; TL-RL-1021; TL-RL-1022



**Add value.  
Inspire trust.**

In accordance with EN IEC 55015 and EN 61547

Prepared for: Tangla lighting and living limited  
10F Mass Mutual Tower, 33 Lockhart Road, Wanchai, HONG KONG

## COMMERCIAL-IN-CONFIDENCE

Report Number: 68.740.23.0452.01

RESPONSIBLE FOR	NAME	SIGNATURE	DATE
Approved By	Dawi Xu		2024-01-31
Prepared By	Henry Chen		2024-01-31

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service control rules.

### EXECUTIVE SUMMARY

A sample of this product was tested and found to be in compliance with EN IEC 55015:2019+A11:2020 and EN IEC 61547:2023.

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# 1 Report Summary

## 1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	2024-01-31

## 1.2 Introduction

The information contained in this report is intended to show verification of the EMC Qualification Approval Testing of the requirements of the standards for the tests listed in Section 1.3.

Applicant	Tangla lighting and living limited
Address	10F Mass Mutual Tower, 33 Lockhart Road, Wanchai, HONG KONG
Manufacturer	Same as applicant
Address	Same as applicant
Model Number(s)	TL-RL-1001; TL-RL-1002; TL-RL-1003; TL-RL-1004; TL-RL-1006; TL-RL-1007; TL-RL-1008; TL-RL-1009; TL-RL-1010; TL-RL-1011; TL-RL-1012; TL-RL-1013; TL-RL-1014; TL-RL-1015; TL-RL-1016; TL-RL-1017; TL-RL-1018; TL-RL-1019; TL-RL-1020; TL-RL-1021; TL-RL-1022
Product Type	LED Rechargeable Lamps
Test Specification	EN IEC 55015:2019+A11:2020 EN IEC 61547:2023
Date of Receipt of EUT	2023-12-26
Start of Test	2023-12-26
Finish of Test	2023-12-29
Name of Engineer(s)	Henry Chen

### 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with EN IEC 55015 and EN IEC 61547 is shown below.

Specification	Clause	Test Description	Result	Comments/Base Standard
EN IEC 55015:2019+A11:2020	4.3.1	Conducted Disturbance at electric power supply interface	N/A	N/A
EN IEC 55015:2019+A11:2020	4.3.2	Conducted Disturbance at wired network interfaces other than power supply	N/A	N/A
EN IEC 55015:2019+A11:2020	4.4	Conducted Disturbance at local wired ports other than electrical power supply interface	Pass	N/A
EN IEC 55015:2019+A11:2020	4.5.2	Radiated Disturbance (9KHz to 30MHz)	Pass	
EN IEC 55015:2019+A11:2020	4.5.3	Radiated Disturbance	Pass	
EN IEC 61547:2023	5.2	Electrostatic discharge immunity test	Pass	IEC 61000-4-2
EN IEC 61547:2023	5.3	Radiated, radio-frequency, electromagnetic field immunity test	Pass	IEC 61000-4-3
EN IEC 61547:2023	5.4	Power frequency magnetic field immunity test	N/A	Note 2
EN IEC 61547:2023	5.5	Electrical fast transient /burst immunity test	Pass	IEC 61000-4-4
EN IEC 61547:2023	5.6	Immunity to conducted disturbances, induced by radio-frequency fields	Pass	IEC 61000-4-6
EN IEC 61547:2023	5.7	Surge immunity test	N/A	Note 1
EN IEC 61547:2023	5.8	Voltage dips, short interruptions and voltage variations immunity test	N/A	Note 1

#### Note

(1): Not apply to DC operated device;

(2): Only applied to equipment containing components susceptible to magnetic fields, such as Hall elements or magnetic field sensors.

### 1.4 Product Information









The portable luminaire for indoor and outdoor use.









While use USB cord charge, it needs to charge indoor.

The product shall be supplied with a general certified independent SELV power supply (such as: use as attachment to a TV, IT equipment ETC. - similar like a computer mouse); and

- With output voltage (constant voltage) equal to rated voltage of this product.
- With output power at least equal to the rated power of this product.
- With the max. rated output current is 2A.

Model list:

Model no.	Size	Weight (kg)	Photo
TL-RL-1001	Ø128*H280	0.8245	 ABS + metal base
TL-RL-1002	Ø128*H500	0.954	
TL-RL-1003	Ø128*H366	0.79	 ABS + metal base
TL-RL-1004	Ø130*H298	1.014	 ABS + metal base
TL-RL-1006	Ø129*H266	0.36	 ABS + metal base
TL-RL-1007	Ø128*H285	0.39	 ABS + metal base
TL-RL-1008	Ø128*H285	0.726	 ABS + Cork base
TL-RL-1009	Ø250*H215	0.4965	 ABS + Bamboo shade
TL-RL-1010	Ø360*H330	0.54	
TL-RL-1011	Ø460*H375	0.60	
TL-RL-1012	Ø152*H198	1.598	 ABS + Glass shade
TL-RL-1013	130*130*H388	0.744	

TL-RL-1014	130*130*H500	1.112	 ABS + metal base
TL-RL-1015	Ø180*H1400	2.4	 ABS + metal base
TL-RL-1016	148*128*H125	0.2485	 ABS+ metal base
TL-RL-1017	190*128*H85	0.3065	 ABS+metal hook
TL-RL-1018	190*128*H85	0.2255	 ABS + wood hook
TL-RL-1019	148*128*H192	0.295	 ABS + metal base
TL-RL-1020	150*130*H426	0.80	 ABS + metal base
TL-RL-1021	150*130*H538	1.1675	
TL-RL-1022	Ø128*H86.5	0.1935	 ABS

Unless otherwise specified, the models TL-RL-1022 (with battery Li-ion 2x1500mAh) was chosen as representative models to perform all tests.



**1.4.1 Technical Description**

The Equipment Under Test (EUT) was a LED Rechargeable Lamps

Rated Voltage: 5VDC

Battery: Li-ion battery, 3.7V, 2\*1500mAh or Li-ion battery, 3.7V, 2000mAh

Rated Power: 1.5W

Protection Class: III

**1.4.2 EUT Port/Cable/Auxiliary Equipment Identification**

Auxiliary Equipment	Brand, Model, Serial	Rating	Remark
Adapter	XIAOMI	Output 5.1V2.1A	---

**1.4.3 Test Configuration**

Configuration	Description
DC Powered	5VDC(Powered by Adapter AC 230V/50Hz)

**1.4.4 Modes of Operation**

Mode	Description
ON(Max)+Charging	the EUT was lighting with maximum output power while charging
ON(Min)+Charging	the EUT was lighting with minimum output power while charging
Remark: The worst case was listed in this report	

#### **1.4.5 Performance Criteria**

Performance criterion A: During the test, no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.

Performance criterion B: During the test, the luminous intensity may change to any value. After the test, the luminous intensity shall be restored to its initial value within 1 min. Regulating controls need not function during the test, but after the test, the mode of the control shall be the same as before the test provided that during the test no mode changing commands were given.

Performance criterion C: During and after the test, any change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30 min, all functions shall return to normal, if necessary by temporary interruption of the mains supply and/or operating the regulating control.

Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour, it is switched on again. The lighting equipment shall start and operate as intended.

#### **1.5 Deviations from the Standard**

No deviations from the applicable test standard were made during testing.

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## 1.6 Test Location

Location 1:  
TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch

Address:  
Building 12 & 13, Zhiheng Wisdomland Business Park, Guankou Eru, Nantou, Nanshan District,  
Shenzhen, 518052 China

Test Name	Name of Engineer(s)
Conducted Disturbance at electric power supply interface	N/A
Conducted Disturbance at wired network interfaces other than power supply	N/A
Conducted Disturbance at local wired ports other than electrical power supply interface	Dylan Gui
Radiated Disturbance (9KHz to 30MHz)	Dylan Gui
Radiated Disturbance	Dylan Gui
Harmonic Current Emissions	N/A
Flicker	N/A
Electrostatic discharge immunity test	Lillie Huang
Radiated, radio-frequency, electromagnetic field immunity test	Reader Sang
Power frequency magnetic field immunity test	N/A
Electrical fast transient /burst immunity test	Lillie Huang
Immunity to conducted disturbances, induced by radio-frequency fields	Lillie Huang
Surge immunity test	N/A
Voltage dips, short interruptions and voltage variations immunity test	N/A

## 2 Test Details

### 2.1 Conducted Disturbance at local wired ports other than electrical power supply interface

#### 2.1.1 Specification Reference

EN IEC 55015:2019+A11:2020, Clause 4.4

#### 2.1.2 Equipment Under Test

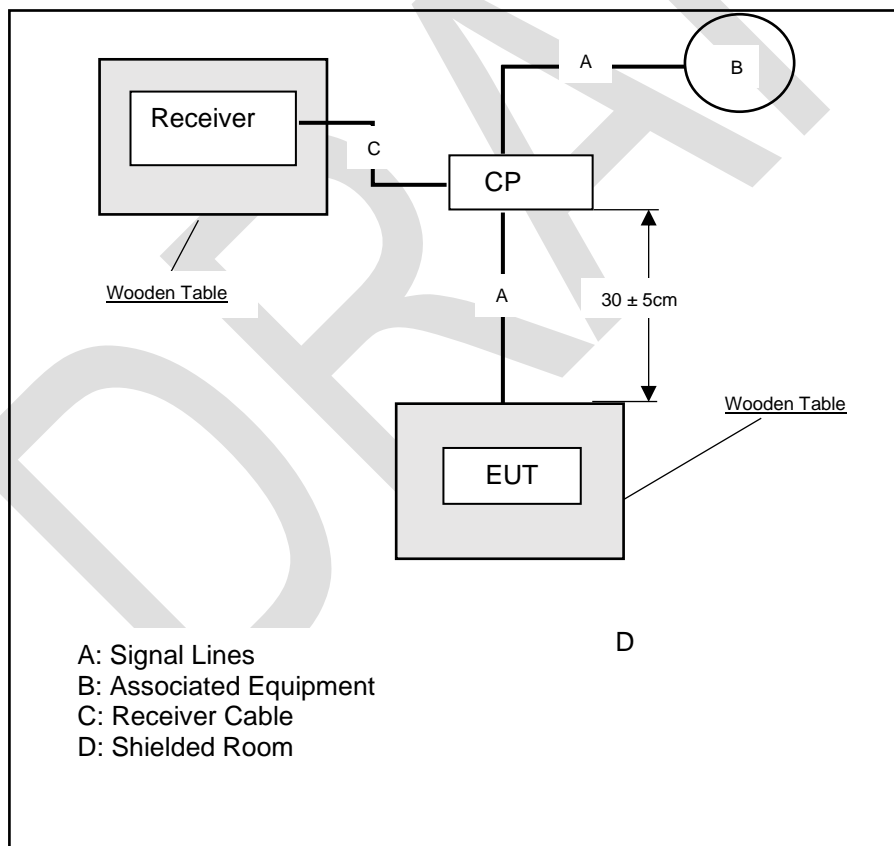
TL-RL-1022

#### 2.1.3 Date of Test

2023-12-28

#### 2.1.4 Test Method

The disturbance voltage shall be measured at the wired network interfaces of the lighting equipment by means of the arrangement described in Figure B.2 for the relevant type of equipment. The Current probe shall be placed at a distance of  $(30 \pm 5)$  cm from the EUT.



**2.1.5 Environmental Conditions**

Ambient Temperature 23.2 °C  
 Relative Humidity 43.2 %  
 Atmospheric Pressure 1023.0 mbar

**2.1.6 Specification Limits**

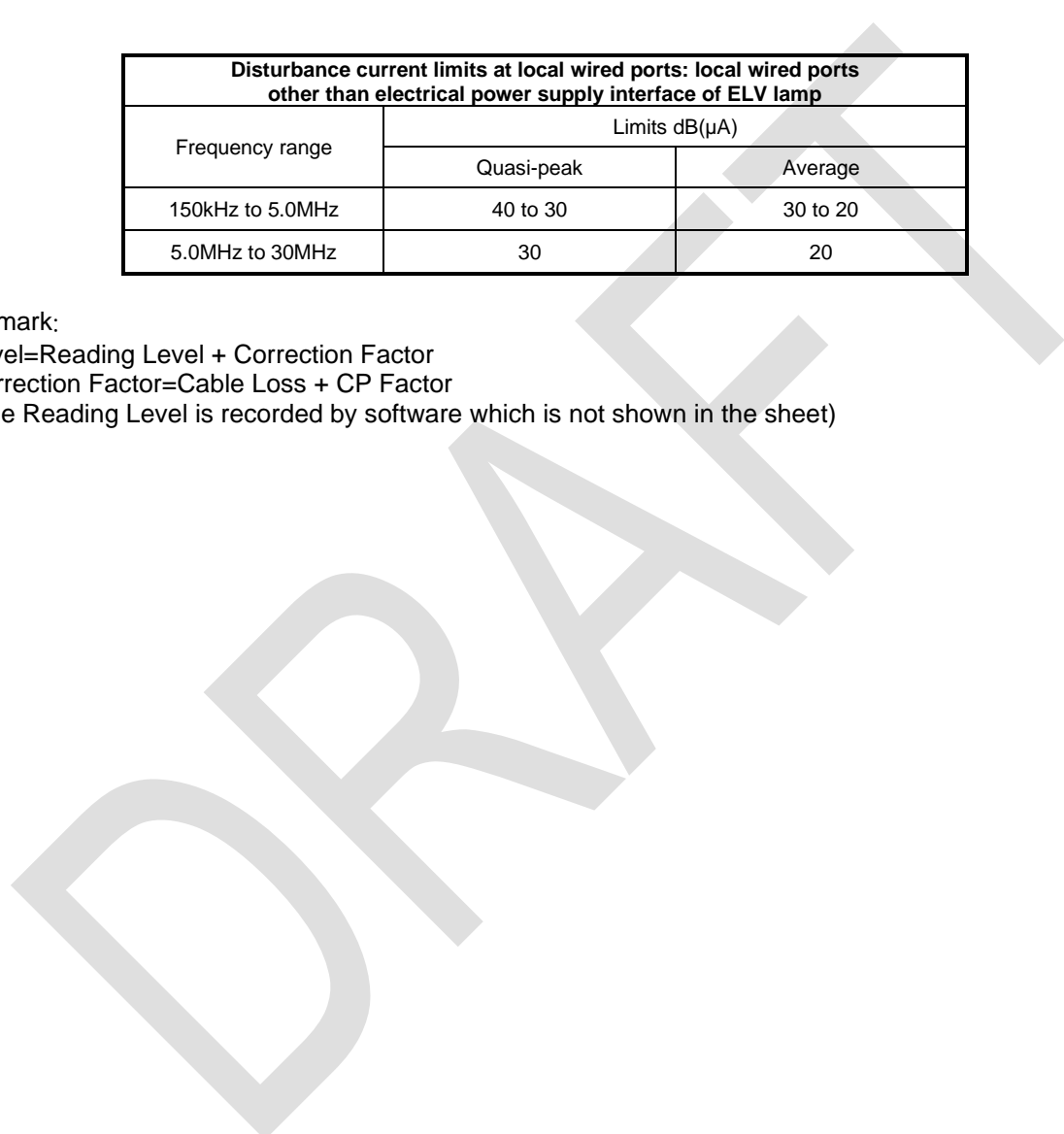
Disturbance current limits at local wired ports: local wired ports other than electrical power supply interface of ELV lamp		
Frequency range	Limits dB(μA)	
	Quasi-peak	Average
150kHz to 5.0MHz	40 to 30	30 to 20
5.0MHz to 30MHz	30	20

Remark:

Level=Reading Level + Correction Factor

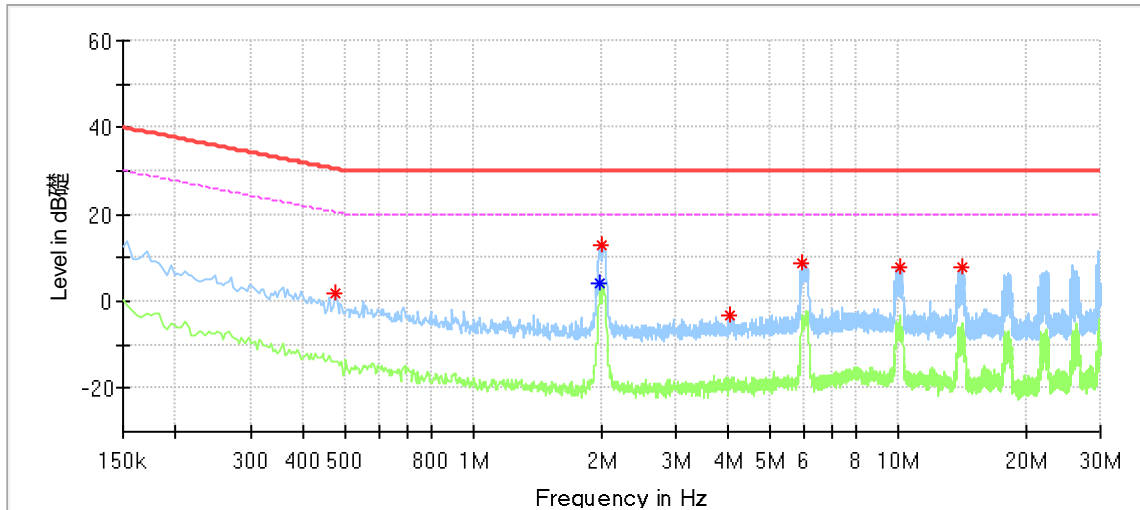
Correction Factor=Cable Loss + CP Factor

(The Reading Level is recorded by software which is not shown in the sheet)



### 2.1.7 Test Results

M/N: TL-RL-1022  
 Op Cond.: ON(Max)+Charging  
 Test Spec: USB Line  
 Comment: 5VDC(Powered by Adapter AC 230V/50Hz)

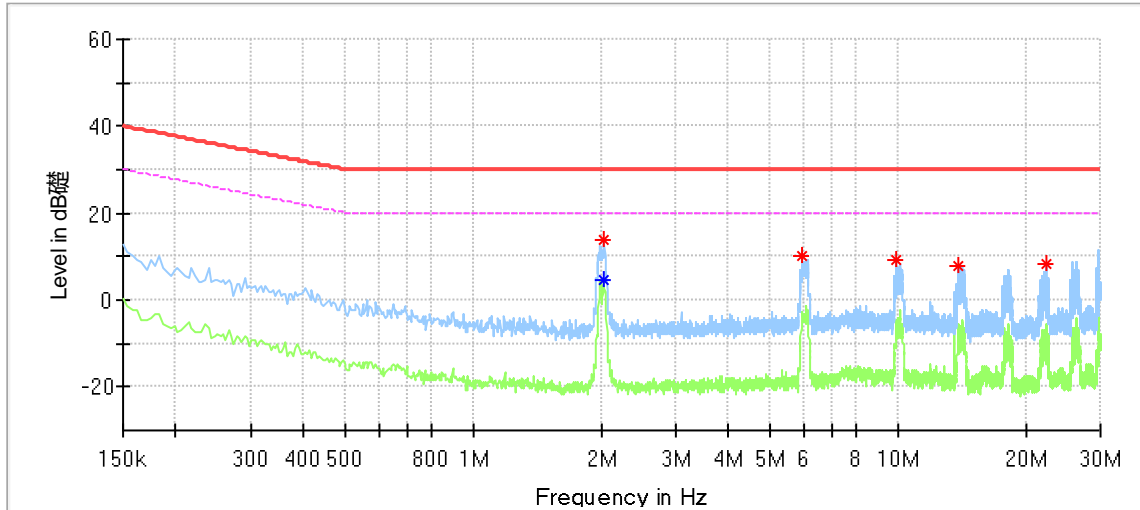


### Critical Freqs

Frequency (MHz)	MaxPeak (dBµA)	Average (dBµA)	Limit (dBµA)	Margin (dB)	Corr. (dB)
0.474000	1.72	---	30.44	28.73	-3.49
1.998000	---	4.13	20.00	15.87	-9.75
2.002000	12.85	---	30.00	17.15	-9.75
4.010000	-3.14	---	30.00	33.14	-10.06
5.946000	8.80	---	30.00	21.20	-10.17
10.142000	7.77	---	30.00	22.23	-10.06
14.194000	7.74	---	30.00	22.26	-10.12

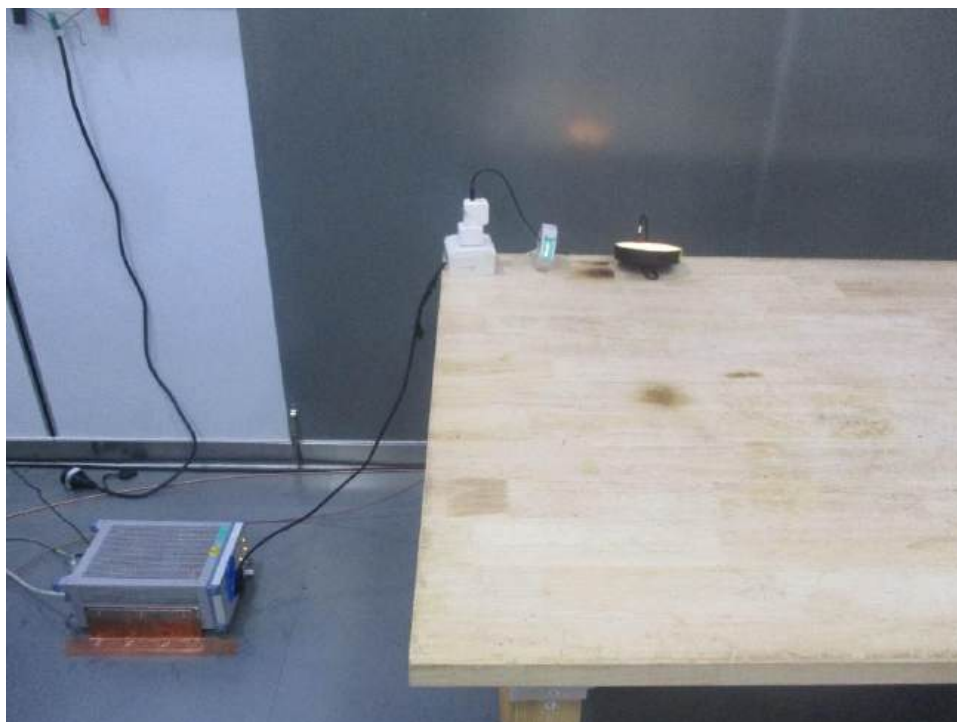


M/N: TL-RL-1022  
 Op Cond.: ON(Min)+Charging  
 Test Spec: USB Line  
 Comment: 5VDC(Powered by Adapter AC 230V/50Hz)



### Critical Freqs

Frequency (MHz)	MaxPeak (dBµA)	Average (dBµA)	Limit (dBµA)	Margin (dB)	Corr. (dB)
2.030000	13.70	---	30.00	16.30	-9.76
2.030000	---	4.83	20.00	15.17	-9.76
5.942000	10.14	---	30.00	19.86	-10.17
9.910000	9.01	---	30.00	20.99	-10.06
13.870000	7.82	---	30.00	22.18	-10.12
22.306000	8.12	---	30.00	21.88	-10.08



**Test Setup**

### **2.1.8 Test Location**

This test was carried out in conducted emission shielded room.

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## 2.2 Radiated Disturbance (9KHz to 30MHz)

### 2.2.1 Specification Reference

EN IEC 55015:2019+A11:2020, Clause 4.5.2

### 2.2.2 Equipment Under Test

TL-RL-1022

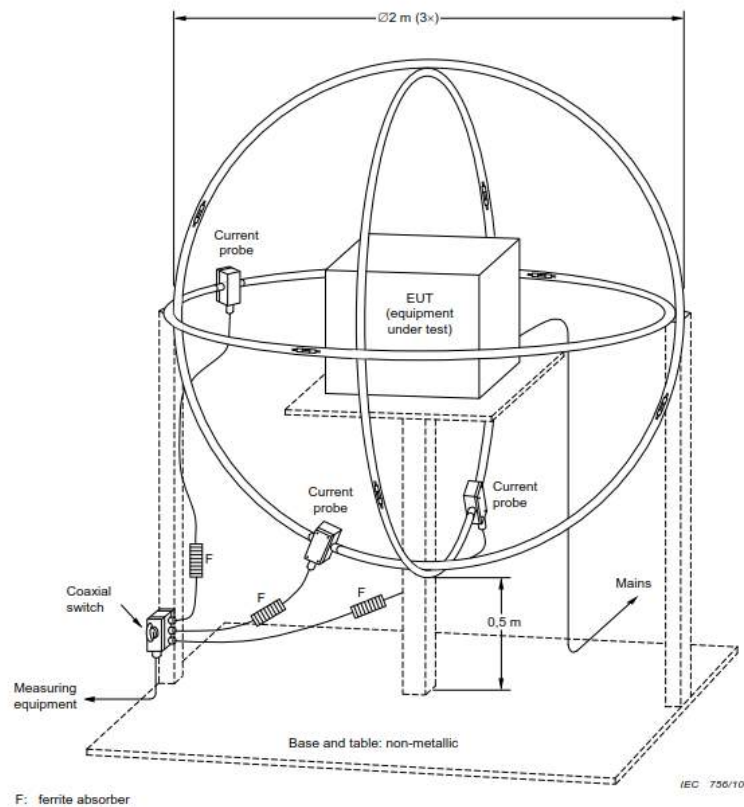
### 2.2.3 Date of Test

2023-12-28

### 2.2.4 Test Method

The magnetic component shall be measured by means of a loop antenna. The lighting equipment shall be placed in the center of the antenna.

The induced current in the loop antenna is measured by means of a current probe and the CISPR measuring receiver. By means of a coaxial switch, the three field directions can be measured in sequence.





**2.2.5 Environmental Conditions**

Ambient Temperature 22.1 °C  
 Relative Humidity 41.2 %  
 Atmospheric Pressure 1023.0 mbar

**2.2.6 Specification Limits**

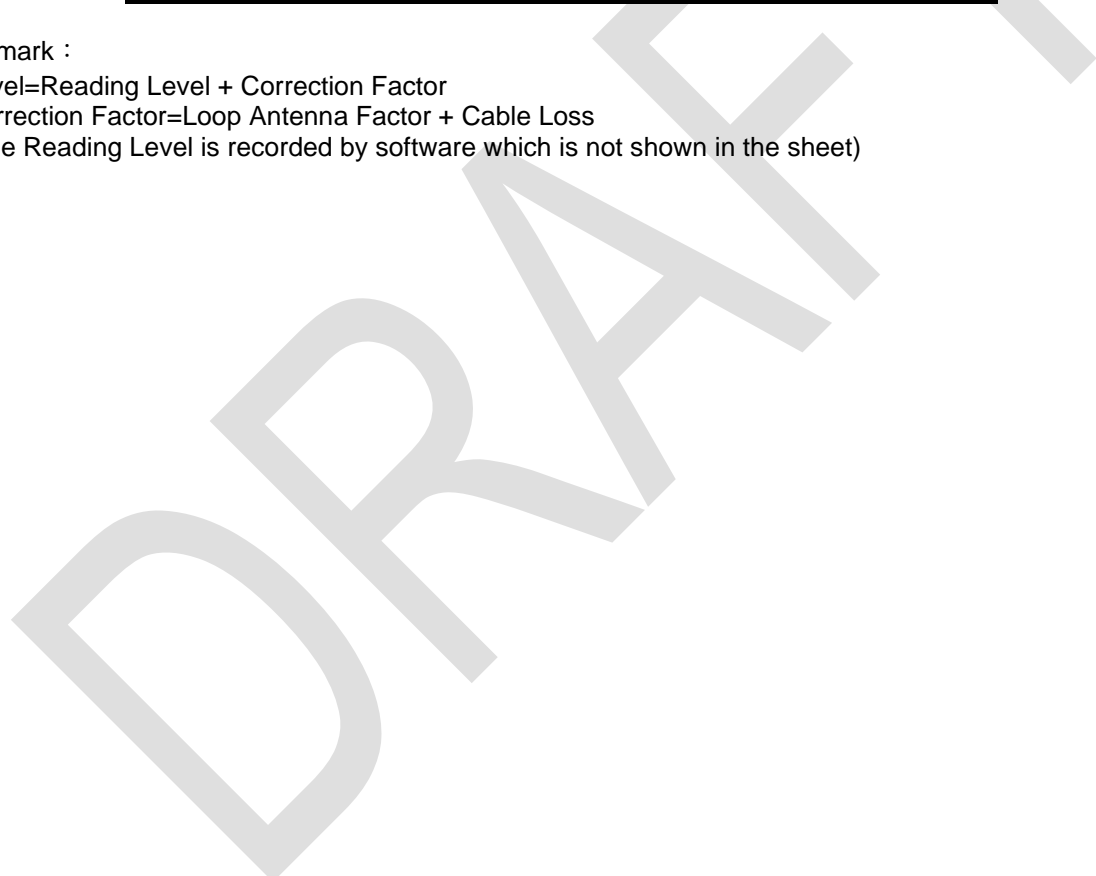
Radiated disturbance limits in the frequency range 9kHz to 30MHz			
Frequency range	Limits dB(μA) for loop diameter		
	2 m	3 m	4 m
9kHz to 70kHz	88	81	75
70kHz to 150kHz	88 to 58	81 to 51	75 to 45
150kHz to 3.0MHz	58 to 22	51 to 15	45 to 9
3.0MHz to 30MHz	22	15 to 16	9 to 12

Remark :

Level=Reading Level + Correction Factor

Correction Factor=Loop Antenna Factor + Cable Loss

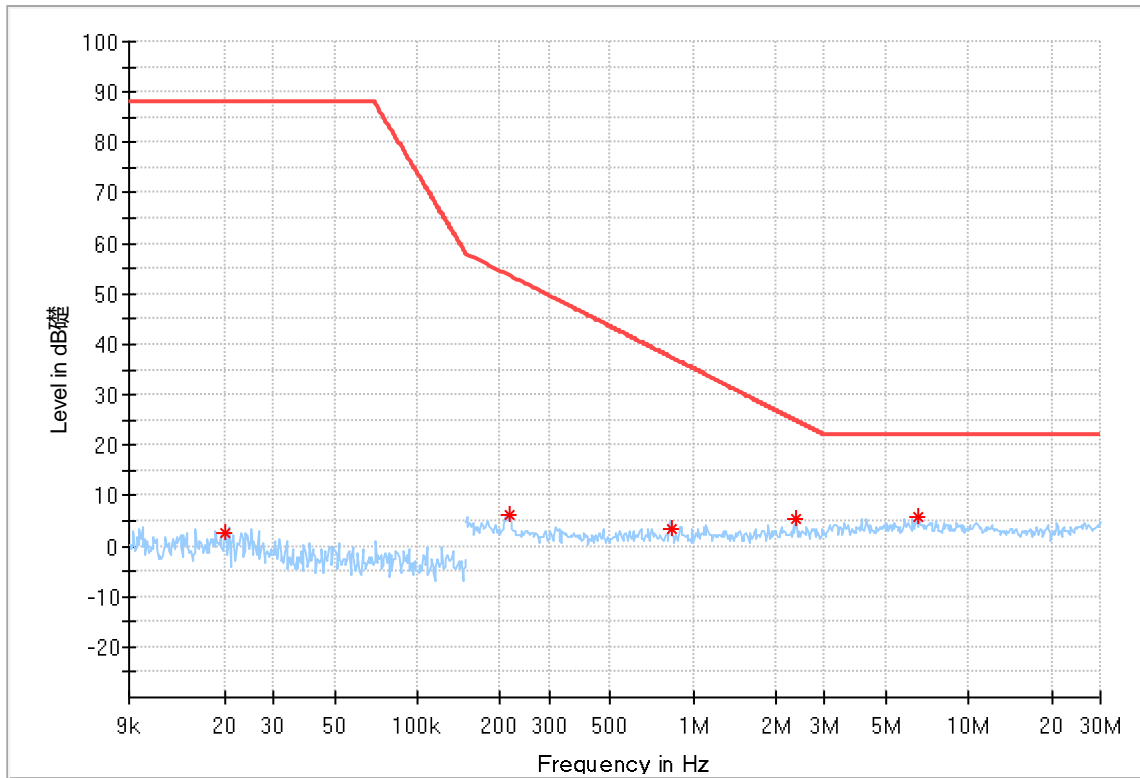
(The Reading Level is recorded by software which is not shown in the sheet)





### 2.2.7 Test Results

M/N: TL-RL-1022  
 Op Cond.: ON(Max)+Charging  
 Test Spec: X  
 Comment: 5VDC(Powered by Adapter AC 230V/50Hz)

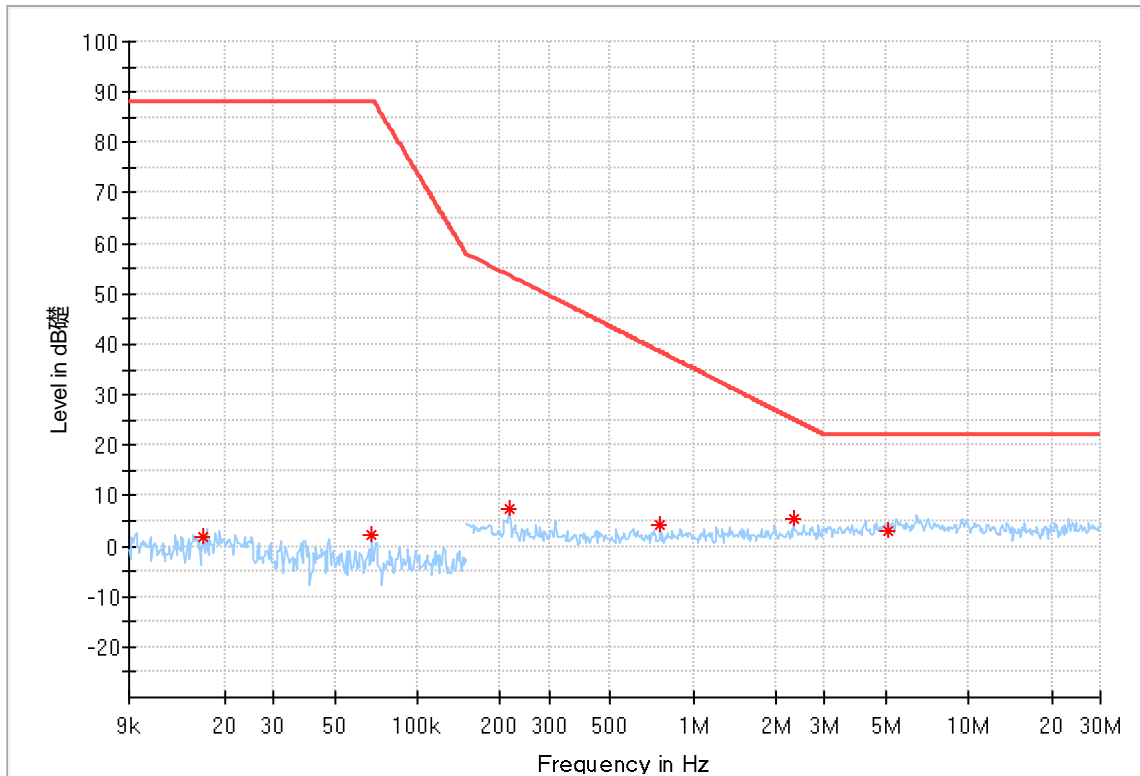


### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµA)	Limit (dBµA)	Margin (dB)	Axis	Corr. (dB)
0.020150	2.56	88.00	85.44	X	6.03
0.216762	6.06	53.58	47.52	X	6.06
0.830554	3.55	37.43	33.89	X	6.12
2.361088	5.32	24.88	19.56	X	6.12
6.579814	5.83	22.00	16.17	X	6.23



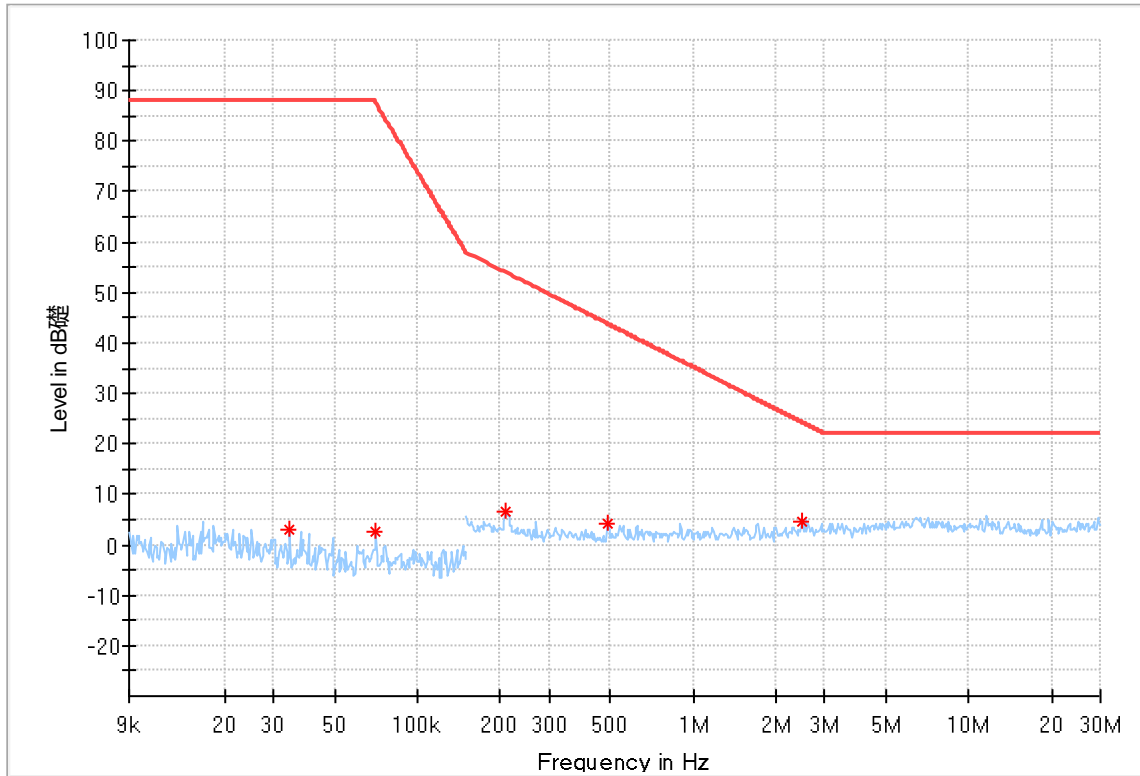
M/N: TL-RL-1022  
 Op Cond.: ON(Max)+Charging  
 Test Spec: Y  
 Comment: 5VDC(Powered by Adapter AC 230V/50Hz)



### Critical\_Freqs

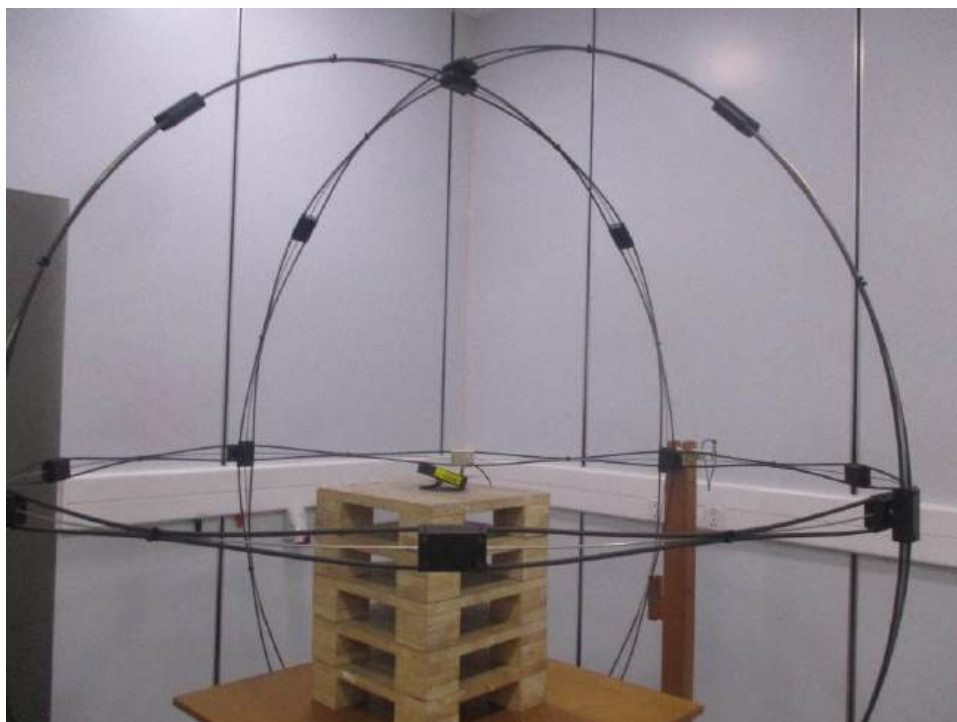
Frequency (MHz)	MaxPeak (dBµA)	Limit (dBµA)	Margin (dB)	Axis	Corr. (dB)
0.016846	1.99	88.00	86.01	Y	6.03
0.068518	2.33	88.00	85.67	Y	6.05
0.214616	7.36	53.70	46.33	Y	6.06
0.759409	4.08	38.51	34.43	Y	6.11
2.314565	5.39	25.12	19.73	Y	6.12
5.130731	2.89	22.00	19.11	Y	6.20

M/N: TL-RL-1022  
 Op Cond.: ON(Max)+Charging  
 Test Spec: Z  
 Comment: 5VDC(Powered by Adapter AC 230V/50Hz)



### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBμA)	Limit (dBμA)	Margin (dB)	Axis	Corr. (dB)
0.034485	2.89	88.00	85.11	Z	6.04
0.070594	2.55	87.67	85.12	Z	6.05
0.210387	6.76	53.93	47.17	Z	6.06
0.490157	4.22	43.77	39.55	Z	6.10
2.481527	4.71	24.28	19.57	Z	6.12



**Test Setup**

### **2.2.8 Test Location**

This test was carried out in conducted emission shielded room.

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**2.3 Radiated Disturbance**

**2.3.1 Specification Reference**

EN IEC 55015:2019+A11:2020, Clause 4.5.3

**2.3.2 Equipment Under Test**

TL-RL-1022

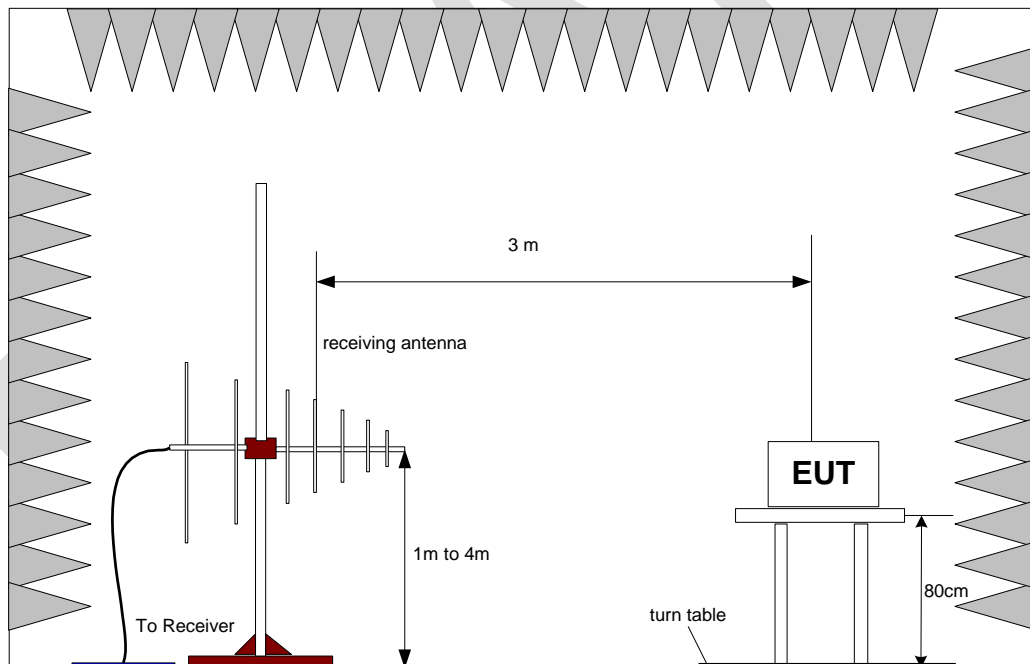
**2.3.3 Date of Test**

2023-12-26

**2.3.4 Test Method**

The EUT was set up in a semi-anechoic chamber on a remotely controlled turntable and placed on a non-conductive. Guidance on how to arrange the luminaire during the measurements can be found in Annex C.

A prescan of the EUT emissions profile was made while varying the antenna-to-EUT azimuth and antenna-to-EUT polarization using a peak detector; measurements were taken at a 3m distance. Using the prescan list of the highest emissions detected, their bearing and associated antenna polarization, the EUT was then formally measured using a Quasi-Peak detector. The readings were maximized by adjusting the antenna height, polarization and turntable azimuth, in accordance with the specification.



### 2.3.5 Environmental Conditions

Ambient Temperature	20.7 °C
Relative Humidity	49.6 %
Atmospheric Pressure	1018.0 mbar

### 2.3.6 Specification Limits

Radiated disturbance limits in the frequency range 30MHz to 1000MHz at a measuring distance of 3 m	
Frequency range MHz	Quasi-peak limits dB( $\mu$ V/m)
30 to 230	40
230 to 1000	47

Remark :

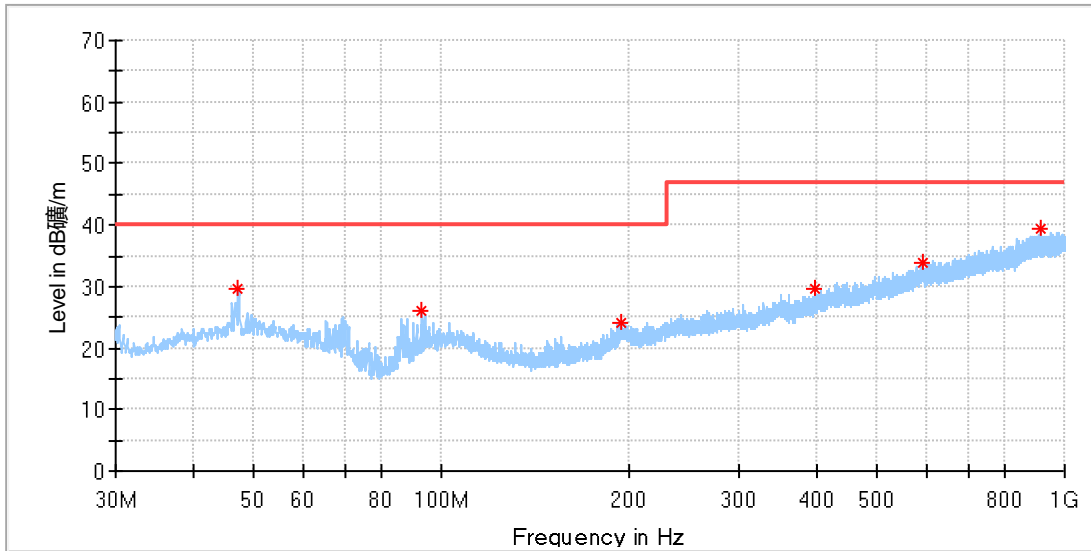
Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss

(The Reading Level is recorded by software which is not shown in the sheet)

### 2.3.7 Test Results

M/N: TL-RL-1022  
 Op Cond.: ON(Max)+Charging  
 Test Spec: Horizontal  
 Comment: 5VDC(Powered by Adapter AC 230V/50Hz)

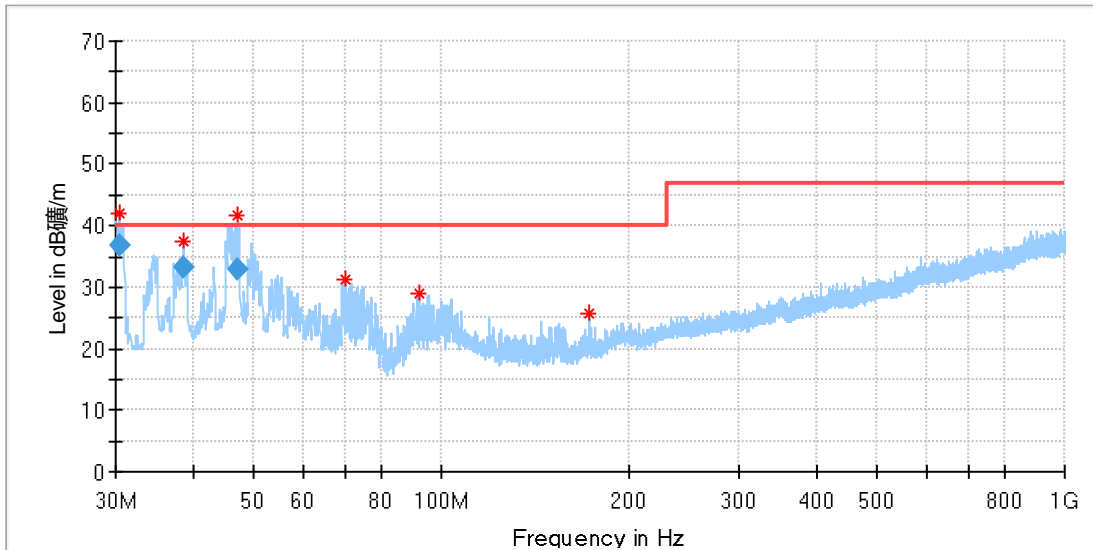


### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
47.217500	29.47	40.00	10.53	200.0	H	139.0	20.57
93.110625	26.01	40.00	13.99	200.0	H	20.0	17.74
194.718125	23.94	40.00	16.06	100.0	H	307.0	19.02
398.357500	29.68	47.00	17.32	100.0	H	273.0	23.95
592.357500	33.80	47.00	13.20	200.0	H	0.0	28.07
916.337500	39.46	47.00	7.54	200.0	H	182.0	32.22



M/N: TL-RL-1022  
 Op Cond.: ON(Max)+Charging  
 Test Spec: Vertical  
 Comment: 5VDC(Powered by Adapter AC 230V/50Hz)



### Critical\_Freqs

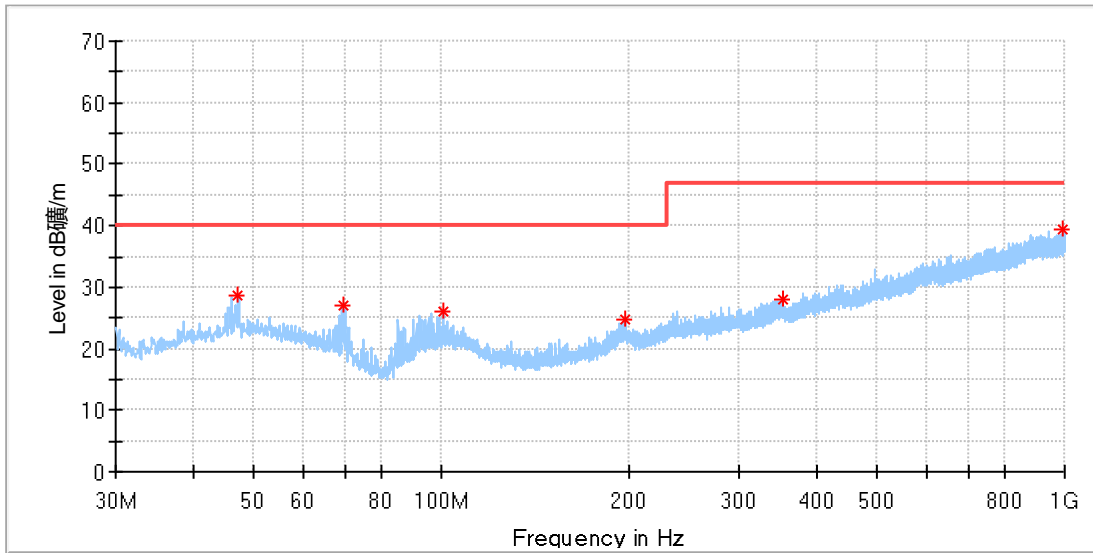
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.363750	42.07	40.00	-2.07	100.0	V	300.0	16.72
38.487500	37.36	40.00	2.64	100.0	V	300.0	18.78
47.156875	41.53	40.00	-1.53	100.0	V	117.0	20.57
70.133750	31.40	40.00	8.60	200.0	V	236.0	16.49
92.080000	28.82	40.00	11.18	100.0	V	0.0	17.43
172.226250	25.70	40.00	14.30	100.0	V	0.0	16.36

### Final\_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.363750	36.80	40.00	3.20	100.0	V	300.0	16.72
38.487500	33.10	40.00	6.90	100.0	V	300.0	18.78
47.156875	33.00	40.00	7.00	100.0	V	117.0	20.57



M/N: TL-RL-1022  
 Op Cond.: ON(Min)+Charging  
 Test Spec: Horizontal  
 Comment: 5VDC(Powered by Adapter AC 230V/50Hz)

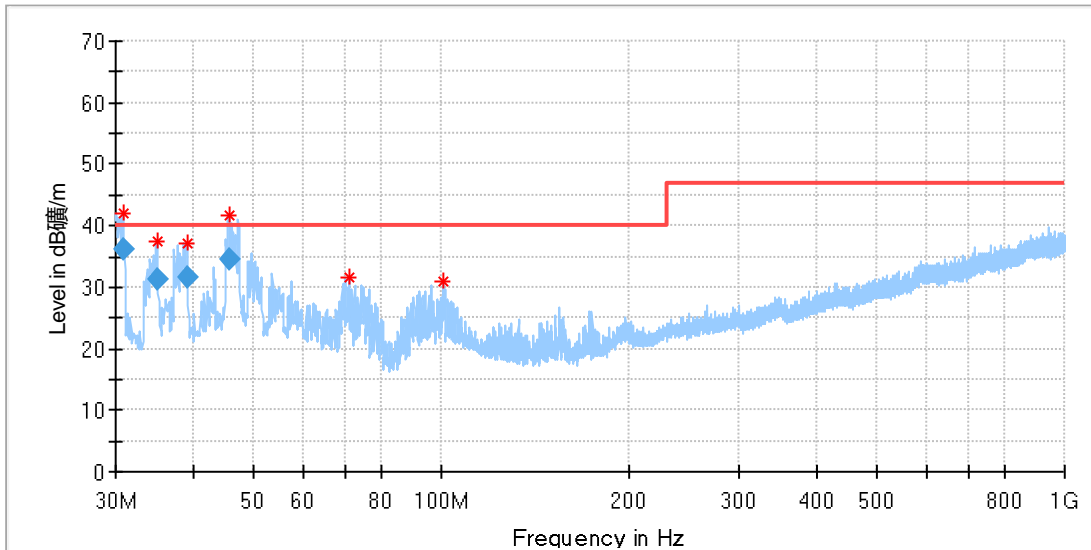


### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
47.156875	28.57	40.00	11.43	100.0	H	15.0	20.57
69.345625	27.07	40.00	12.93	200.0	H	5.0	16.80
100.567500	26.15	40.00	13.85	200.0	H	0.0	19.01
196.779375	24.86	40.00	15.14	200.0	H	304.0	19.30
352.646250	28.04	47.00	18.96	100.0	H	0.0	23.23
991.755000	39.34	47.00	7.66	200.0	H	210.0	32.60



M/N: TL-RL-1022  
 Op Cond.: ON(Min)+Charging  
 Test Spec: Vertical  
 Comment: 5VDC(Powered by Adapter AC 230V/50Hz)



### Critical\_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.788125	42.15	40.00	-2.15	100.0	V	206.0	16.64
34.910625	37.46	40.00	2.54	100.0	V	338.0	17.41
39.033125	37.14	40.00	2.86	100.0	V	338.0	18.99
45.580625	41.70	40.00	-1.70	100.0	V	8.0	20.50
70.982500	31.59	40.00	8.41	200.0	V	352.0	16.16
100.628125	30.80	40.00	9.20	100.0	V	1.0	19.02

### Final\_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
30.788125	36.30	40.00	4.70	100.0	V	206.0	16.64
34.910625	31.20	40.00	8.80	100.0	V	338.0	17.41
39.033125	31.70	40.00	8.30	100.0	V	338.0	18.99
45.580625	34.60	40.00	5.40	100.0	V	8.0	20.50



**Test Setup**

### **2.3.8 Test Location**

This test was carried out in 3m anechoic chamber.

**2.4 Electrostatic discharge immunity test**

**2.4.1 Specification Reference**

EN IEC 61547:2023, Clause 5.2

**2.4.2 Equipment Under Test**

TL-RL-1022

**2.4.3 Date of Test**

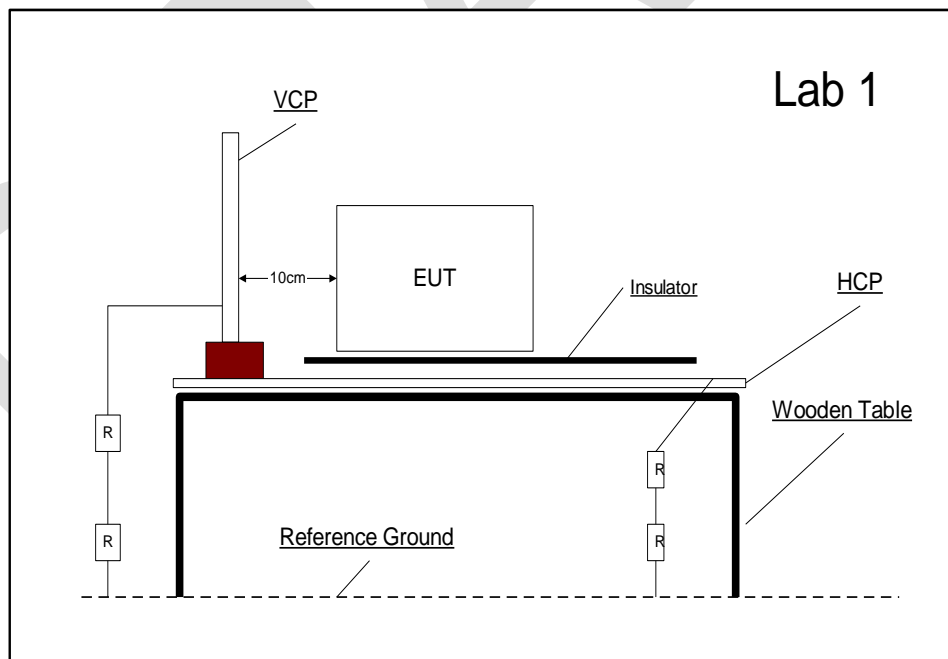
2023-12-29

**2.4.4 Test Method**

The equipment under test including associated cabling was configured on but insulated from, using a 0.5mm isolator, a horizontal coupling plane fitted to the top of a 0.8m non-conductive table for table-top equipment; and on a 0.1m insulated support for floor standing equipment; above a ground reference plane all within a test laboratory.

Using the air discharge method for non-metallic parts, contact discharge method for metallic parts with both vertical and horizontal couple plane discharge methods for the sides of the equipment under test, the required electrostatic discharge voltage levels in both voltage polarities were applied at the detailed pulse repartition rate.

During this testing any anomalies in the equipment under tests performance was recorded.





**2.4.5 Environmental Conditions**

Ambient Temperature 23.9 – 24.1 °C  
 Relative Humidity 51.0 – 51.7 %  
 Atmospheric Pressure 1024.0 mbar

**2.4.6 Specification Limits**

Required Test Levels				Performance Criteria
Discharge type	Discharge Level (kV)		Number of discharges per location (each polarity)	
	Positive	Negative		
Air – Direct	2, 4 and 8	2, 4 and 8	<10>	B
Contact – Direct	2 and 4	2 and 4	<10>	B
Contact – Indirect	2 and 4	2 and 4	<10>	B

**2.4.7 Test Results**

Results for Configuration and Mode: DC Powered/ ON(Min)+Charging

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

ID	Test Point	Discharge	Results									
			2kV		4kV		6kV		8kV		15kV	
			+	-	+	-	+	-	+	-	+	-
	HCP	Contact	A	A	A	A	N/A	N/A	N/A	N/A	N/A	N/A
	VCP	Contact	A	A	A	A	N/A	N/A	N/A	N/A	N/A	N/A
	Each conductive location touchable by hand	Contact	A	A	A	A	N/A	N/A	N/A	N/A	N/A	N/A
	Each nonconductive location touchable by hand	Air	A	A	A	A	N/A	N/A	A	A	N/A	N/A
N/A		Not Appliance										
Remark		NIL										



**Test Setup**

#### **2.4.8 Test Location**

This test was carried out in ESD room.

DRAFT

## 2.5 Radiated, radio-frequency, electromagnetic field immunity test

### 2.5.1 Specification Reference

EN IEC 61547:2023, Clause 5.3

### 2.5.2 Equipment Under Test

TL-RL-1022

### 2.5.3 Date of Test

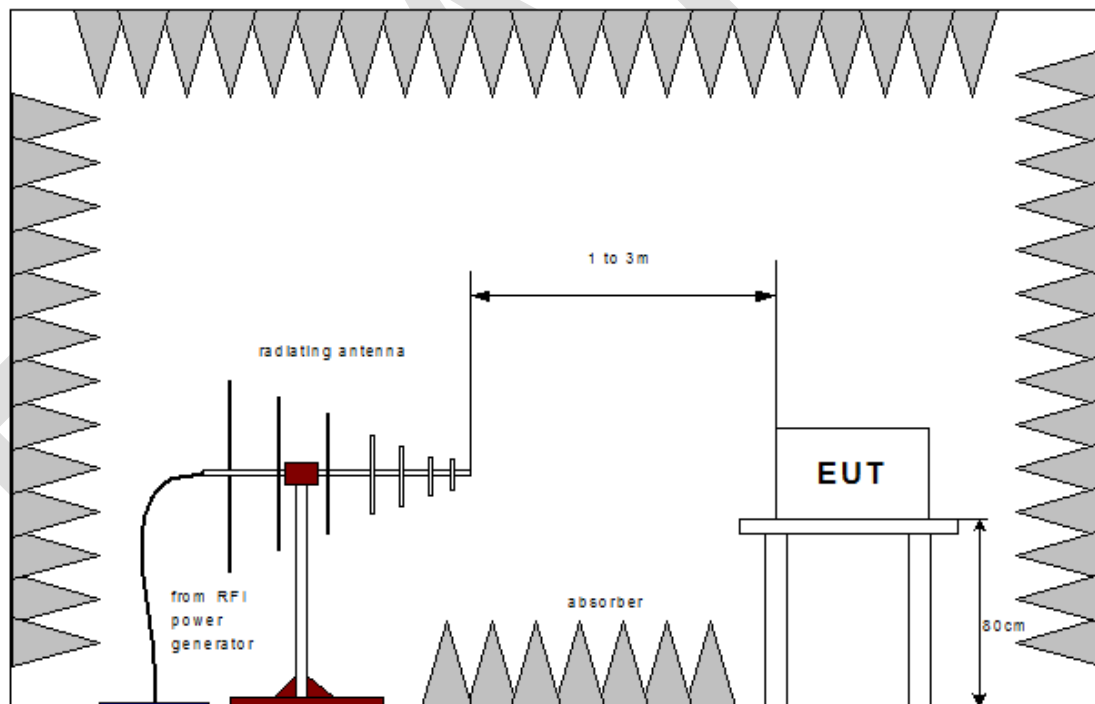
2023-12-24

### 2.5.4 Test Method

The equipment under test including associated cabling was configured, on a 0.8 m non-conductive table for table-top equipment and on a 0.1 m insulated support for floor standing equipment; with a pre-calibrated semi anechoic chamber.

All four side of the equipment under test were subjected to the required RF field strength, modulated as described, swept over the frequency range of test with the antenna positioned in both horizontal and vertical polarizations.

During this testing any anomalies in the equipment under tests performance was recorded.





**2.5.5 Environmental Conditions**

Ambient Temperature 23.1 °C  
 Relative Humidity 42.9 %  
 Atmospheric Pressure 1020.0 mbar

**2.5.6 Specification Limits**

Required Test Levels					Performance Criteria
Frequency Range (MHz)	Level (V/m)	Modulation	Step Size (%)	Dwell (s)	
80 to 1000	3	AM (80 %, 1 kHz, sine wave)	1	1	A
Note 1. EUT powered at one of the Nominal input voltages and frequencies					

**2.5.7 Test Results**

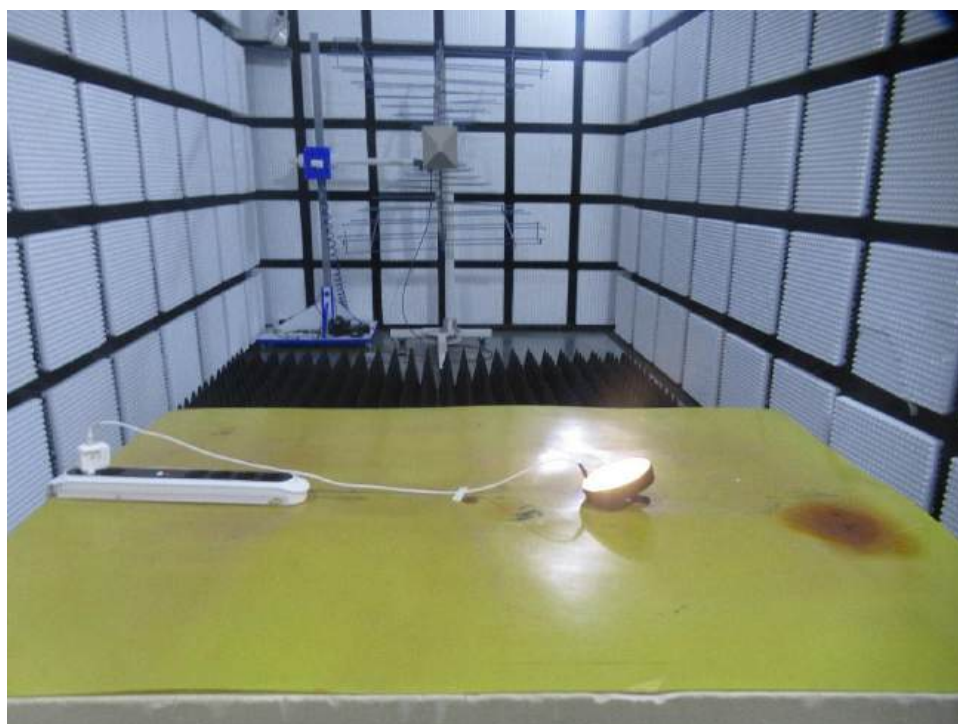
Results for Configuration and Mode: DC Powered/ ON(Min)+Charging

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Tabulated Results for RF Electromagnetic Field 80 - 1000 MHz				
Side of the equipment under test	Antenna polarization	Test Level	Dwell Time	Result
All sides	horizontal	3 V/m	1 s	A
All sides	vertical	3 V/m	1 s	A
Remark	NIL			





**Test Setup**

### **2.5.8 Test Location**

This test was carried out in 3m anechoic chamber.

DRAFT

## 2.6 Electrical fast transient /burst immunity test

### 2.6.1 Specification Reference

EN IEC 61547:2023, Clause 5.5

### 2.6.2 Equipment Under Test

TL-RL-1022

### 2.6.3 Date of Test

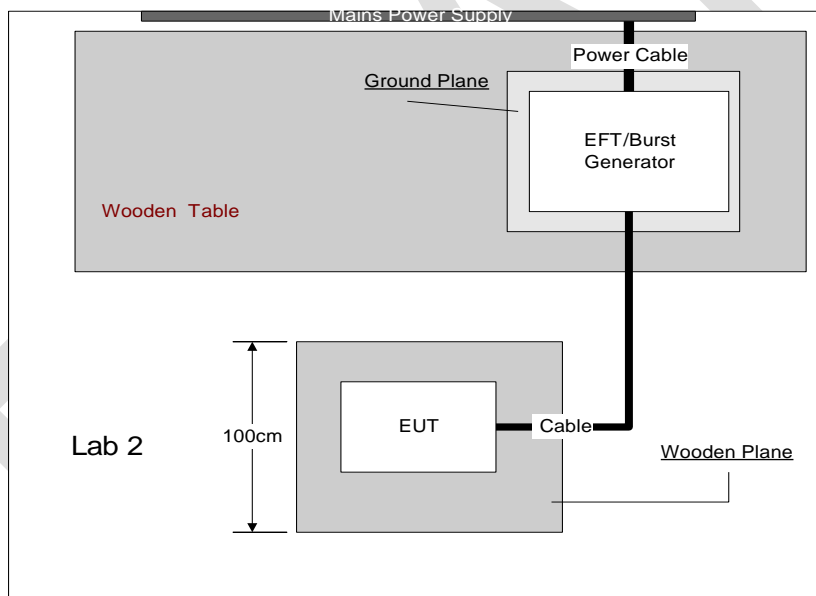
2023-12-29

### 2.6.4 Test Method

The equipment under test including associated cabling was configured on but insulated from, using a 0.1 m isolator, a horizontal coupling plane fitted to the top of a 0.8 m non-conductive table for table-top equipment; and on a 0.1 m insulated support for floor standing equipment; above a ground reference plane all within a test laboratory.

Using a CDN for power ports, capacitive coupling clamp for signal and control ports and a 33nF coupling capacitor for earth ports, the required fast transient burst voltage levels in both voltage polarities were applied at the detailed pulse repartition rate and duration of test.

During this testing any anomalies in the equipment under tests performance was recorded.



### 2.6.5 Environmental Conditions

Ambient Temperature	23.7 °C
Relative Humidity	51.6 %
Atmospheric Pressure	1024.0 mbar



**2.6.6 Specification Limits**

Required Test Levels at input and output d.c. power port					Performance Criteria
Line Under Test	Level (kV)	Repetition Rate (kHz)	Test Duration	Coupling Method	
DC Power Port	± 0.5	5	1 min per polarity	Direct	B
Note 1. EUT powered at one of the Nominal input voltages and frequencies					

**2.6.7 Test Results**

Results for Configuration and Mode: DC Powered/ ON(Min)+Charging

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Tabulated Results for Fast Transient Burst Immunity					
Line under test	Test Level (kV)	Repetition Rate	Test Duration	Coupling Method	Result
power line	± 0.5	5 kHz	2 min	CDN	A
Remark	NIL				



Test Setup

### 2.6.8 Test Location

This test was carried out in EMS Test Location.

DRAFT

**2.7 Immunity to conducted disturbances, induced by radio-frequency fields**

**2.7.1 Specification Reference**

EN IEC 61547:2023, Clause 5.6

**2.7.2 Equipment Under Test**

TL-RL-1022

**2.7.3 Date of Test**

2023-12-29

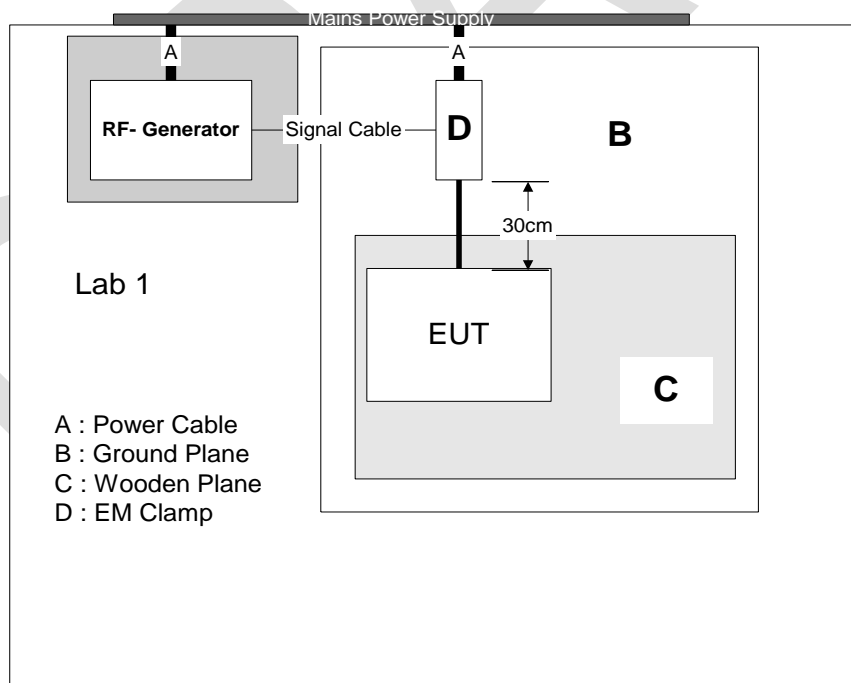
**2.7.4 Test Method**

The equipment under test was configured, on but insulated from, using a 0.1 m isolator, a horizontal coupling plane fitted to the top of a 0.8 m non-conductive table for table-top equipment; and on a 0.1 m insulated support for floor standing equipment; above a ground reference plane all within a test laboratory.

All associated cabling was configured, on but insulated from, using a 50 mm isolator, the same horizontal coupling plane as the equipment under test.

Using CDNs, EM Clamps or current clamps as appropriate, the power ports and applicable signal and control ports were subjected to the required, pre calibrated RF injected signal strength, modulated as described, swept over the frequency range of test.

During this testing any anomalies in the equipment under tests performance was recorded.





**2.7.5 Environmental Conditions**

Ambient Temperature 24.5 °C  
 Relative Humidity 50.9 %  
 Atmospheric Pressure 1024.0 mbar

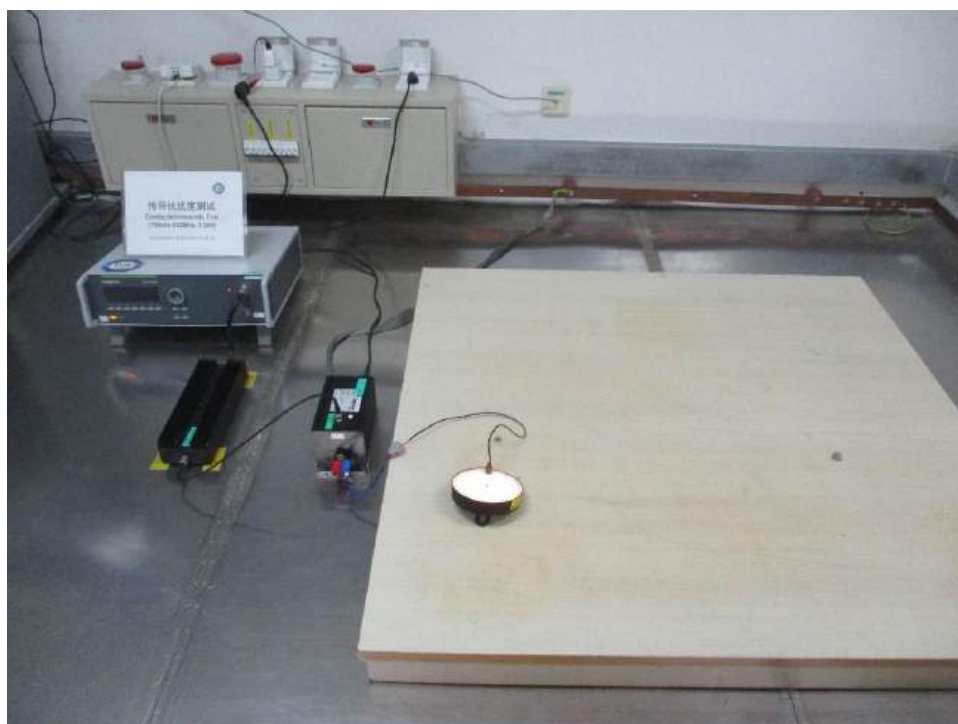
**2.7.6 Specification Limits**

Required Test Levels at input and output d.c. power ports						Performance Criteria
Line Under Test	Frequency Range (MHz)	Level (V)	Modulation	Step Size (%)	Dwell (s)	
DC power ports	0.15 to 80	3	AM (80 %,1 kHz, sine wave)	1	1	A
Note Only applicable to ports interfacing with cables whose total length, according to the manufacturer's specification, may exceed 3m						

**2.7.7 Test Results**

Results for Configuration and Mode: DC Powered/ ON(Min)+Charging  
 Performance assessment of the EUT made during this test: Pass.  
 Detailed results are shown below.

Tabulated Results for Injected current						
Line under test	Test Level	Step	Dwell Time	Coupling Method	Modulation	Result
power line	3V	1%	1S	CDN	1KHZ 80%	A
Remark	NIL					



Test Setup

### 2.7.8 Test Location

This test was carried out in EMS Test Location.

DRAFT

### 3 Test Equipment Information

#### 3.1 General Test Equipment Used

##### Radiated Emission Test 1# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 7	68-4-74-19-001	102176	1	2024-5-20
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	68-4-80-14-002	707	1	2024-7-18
Horn Antenna	Rohde & Schwarz	HF907	68-4-80-14-005	102294	1	2024-5-28
Loop Antenna	Rohde & Schwarz	HFH2-Z2	68-4-80-14-006	100398	1	2024-8-7
Pre-amplifier	Rohde & Schwarz	SCU 18	68-4-29-14-001	102230	1	2024-5-19
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-001	15542	1	2024-5-19
3m Semi-anechoic chamber	TDK	SAC-3 #1	68-4-90-14-001	----	3	2024-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-14-001-A10	Version10.35.02	N/A	N/A

##### Conducted Emission 2# Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-19-002	102590	1	2024-5-19
LISN	Rohde & Schwarz	ENV216	68-4-87-19-001	102472	1	2024-5-20
ISN	Rohde & Schwarz	ENY81	68-4-87-14-003	100177	1	2024-5-20
ISN	Rohde & Schwarz	ENY81-CA6	68-4-87-14-004	101664	1	2024-5-20
High Voltage Probe	Schwarzbeck	TK9420(VT9420)	68-4-27-14-001	9420-584	1	2024-5-28
RF Current Probe	Rohde & Schwarz	EZ-17	68-4-27-14-002	100816	1	2024-5-28
Attenuator	Shanghai Huaxiang	TS2-26-3	68-4-81-16-003	080928189	1	2024-5-19
Test software	Rohde & Schwarz	EMC32	68-4-90-19-005-A01	Version10.35.02	N/A	N/A
Shielding Room	TDK	CSR #2	68-4-90-19-005	----	3	2025-10-15

##### Radiated Electromagnetic Disturbance

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 3	68-4-74-19-002	102590	1	2024-5-19
Triple Loop Antenna	Rohde & Schwarz	HM020	68-4-80-14-001	100951	1	2024-6-14
Test software	Rohde & Schwarz	EMC32	68-4-90-19-005-A01	Version 10.35.02	N/A	N/A

##### Electrostatic Discharge Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Electrostatic Discharge Simulator	Noiseken	ESS-2002	68-4-75-14-007	ESS0615075	1	2024-6-15



### Radiated Immunity Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Signal Generator	Rohde & Schwarz	SMB100A	68-4-48-14-002	177600	1	2024-5-19
Power Amplifier	Rohde & Schwarz	BBA100	68-4-28-14-001	101238	1	2024-5-20
Power Amplifier	Rohde & Schwarz	BBA150	68-4-28-14-002	101671	1	2024-5-20
Power Amplifier	Rohde & Schwarz	BBA150-E100	68-4-28-17-001	102640	1	2024-5-20
Log-Periodic Antenna	Rohde & Schwarz	HL046E	68-4-80-14-009	100160	N/A	N/A
Microwave Log-Periodic Antenna	Rohde & Schwarz	STLP 9149	68-4-80-17-001	9149-453	N/A	N/A
Power Meter	Rohde & Schwarz	NRP2	68-4-32-14-001	103497	1	2024-5-19
Average Power Sensor	Rohde & Schwarz	NRP-Z91	68-4-32-14-001-A01	102538	1	2024-5-19
Average Power Sensor	Rohde & Schwarz	NRP-Z91	68-4-32-14-001-A02	102539	1	2024-5-19
Starprobe Laser-Powered Probe	AMPLIFIER RESEARCH	FL7006/KIT	68-4-27-14-003	0433720	1	2024-8-13
Audio Analyzer	Rohde & Schwarz	UPV	68-4-74-18-001	104348	1	2024-5-20
Fully Anechoic Chamber	TDK	8X4X4	68-4-90-14-002	--	3	2024-9-2
Test software	Rohde & Schwarz	EMC32	68-4-90-14-002-A11	Version 9.15.03	N/A	N/A

### Electrical Fast Transients Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Immunity simulator	EMTEST	EFT 500	68-4-75-14-006	1094-37	1	2024-5-19

### Conducted Immunity Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Continuous Wave Simulator	EMTEST	CWS 500N1	68-4-75-14-002	P1420134224	1	2024-5-19
Attenuator	EMTEST	ATT6/80	68-4-75-14-002-A01	P1402129090	1	2024-5-20
CDN	EMTEST	CDN-M2/M3	68-4-75-14-002-A02	P1420134163	1	2024-5-19
CDN	EMTEST	CDN-M4	68-4-75-14-002-A03	P1346125919	1	2024-5-19
Electromagnetic Injection Clamp	EMTEST	EM101	68-4-75-14-002-A04	P1411132453	1	2024-5-19
Current injection probe	TESEQ	CIP 9136A	68-4-27-22-001	63664	1	2024-5-20
Test software	EMTEST	icd.control	68-4-75-14-002-A10	Version 5.2.9	N/A	N/A



## 4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in 3m chamber (68-4-90-14-001) 30MHz-1000MHz	Horizontal: 4.64dB; Vertical: 4.79dB;
Uncertainty for Conducted Emission 150kHz-30MHz in shielding room (68-4-90-19-004) (for test using RF Current Clamp EZ-17)	2.73 dB
Uncertainty for Radiated Electromagnetic Disturbance in shielding room (68-4-90-19-005) 9KHz-30MHz	3.20dB
Uncertainty for RS test	1.78dB
Uncertainty for ESD test	The immunity measurement system uncertainty is within standard requirement and is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

### Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2021, clause 4.4.3 and 4.5.1.

## 5 Photographs

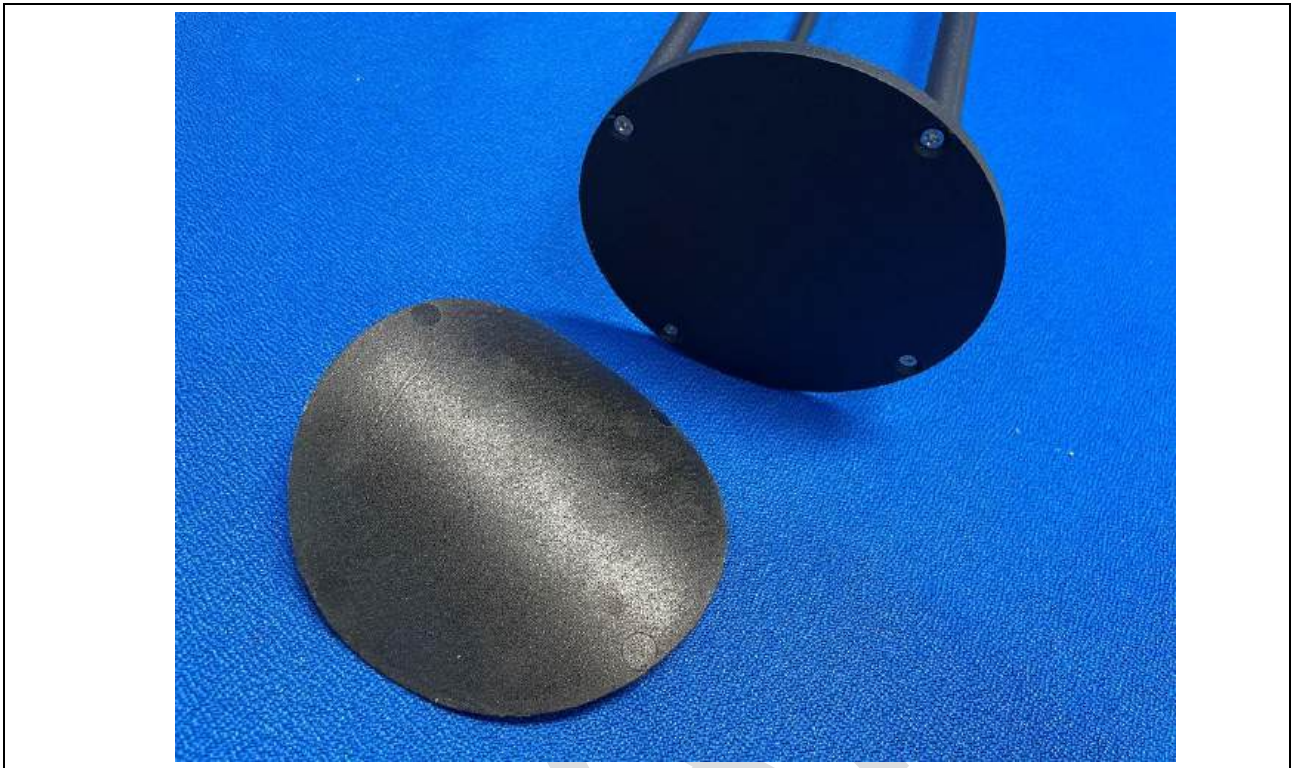
Details of: Outlook for TL-RL-1001, TL-RL-1002  
Representative model TL-RL-1002



Details of: Outlook for TL-RL-1001, TL-RL-1002  
Representative model TL-RL-1002



Details of: Base view for TL-RL-1001, TL-RL-1002



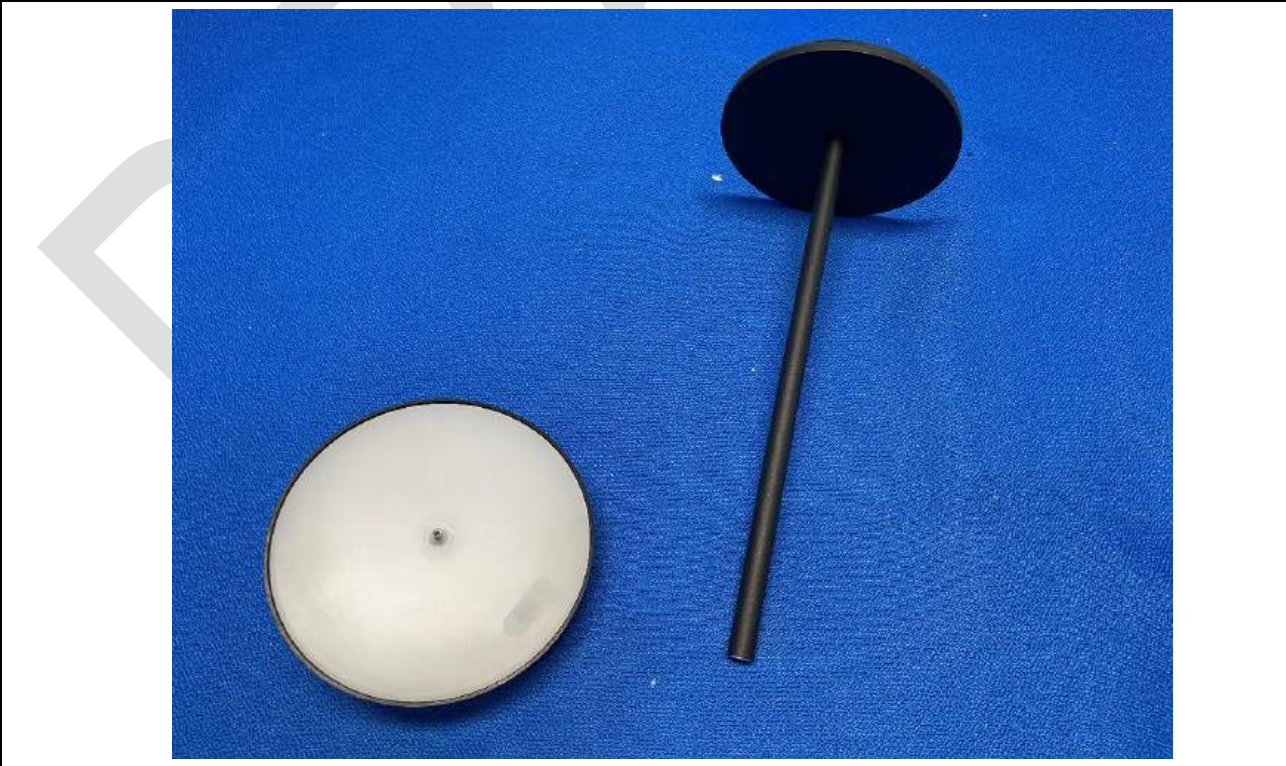
Details of: Detail view for TL-RL-1001, TL-RL-1002



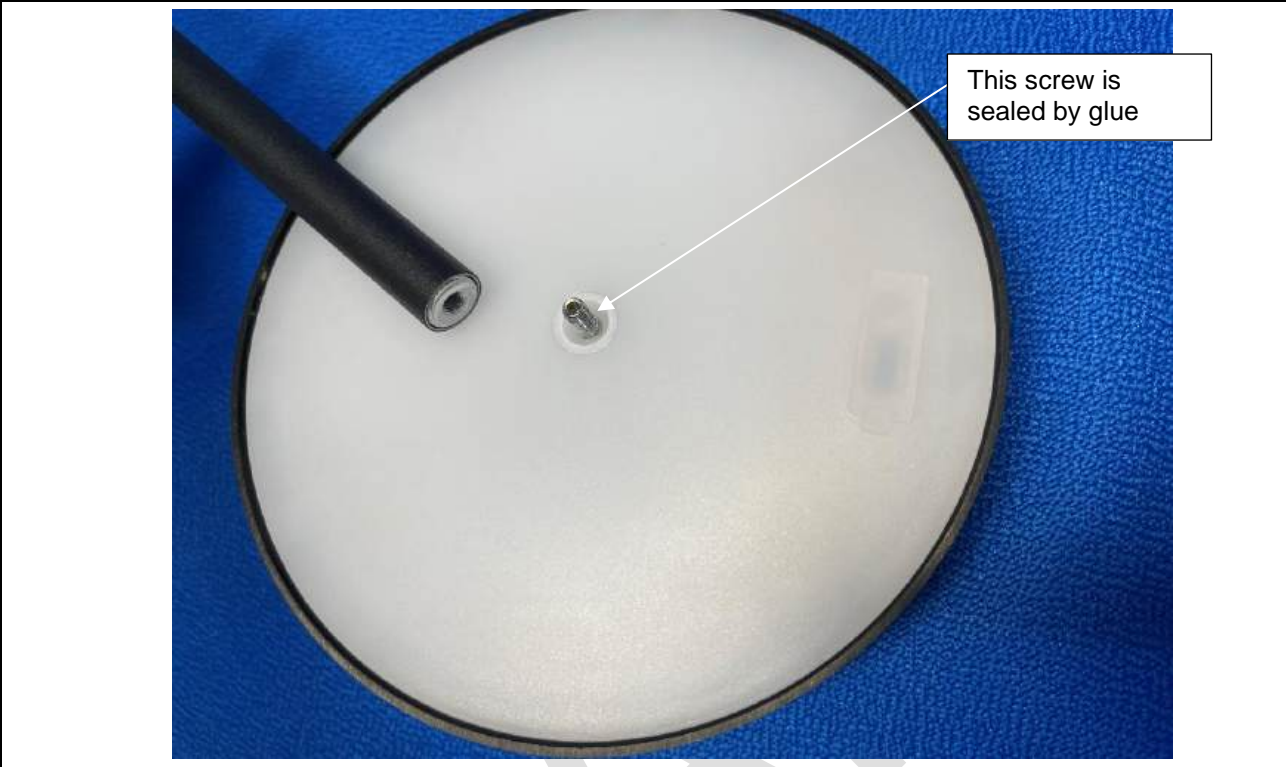
Details of: Outlook for TL-RL-1003



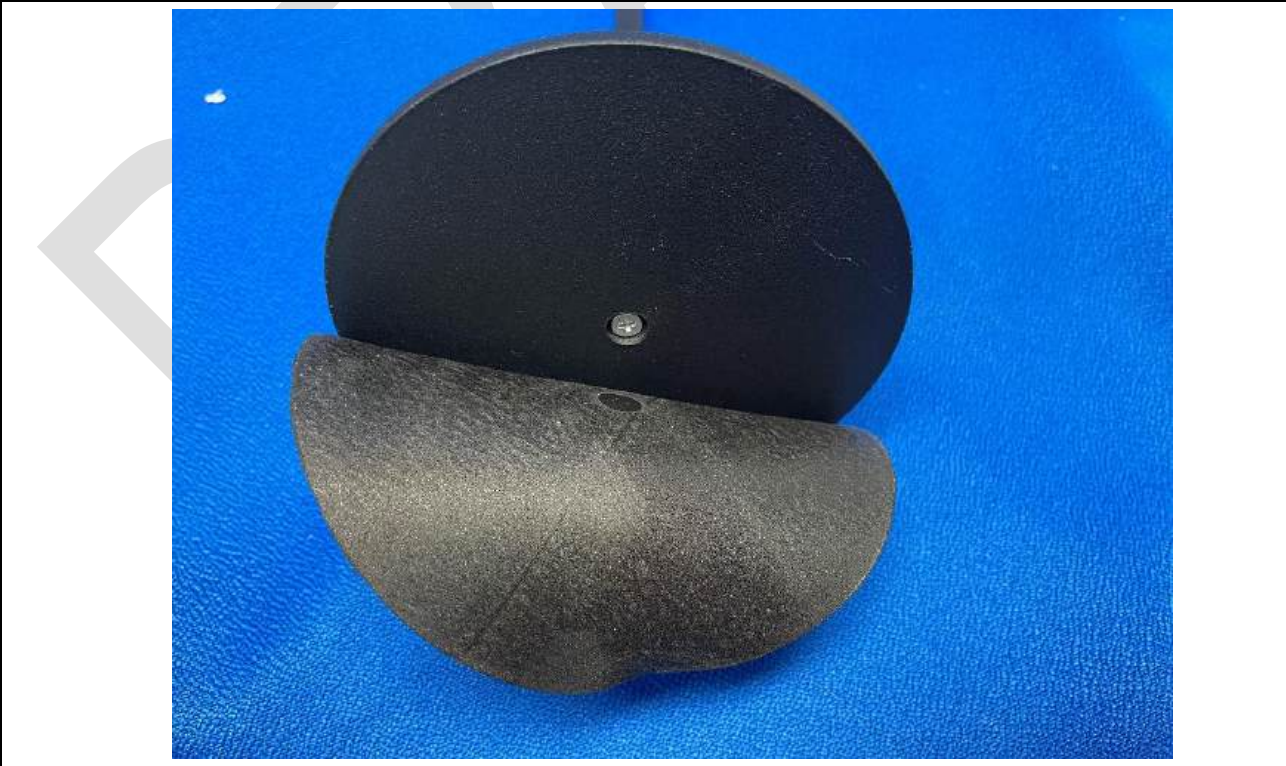
Details of: Outlook for TL-RL-1003



Details of: Detail view for TL-RL-1003



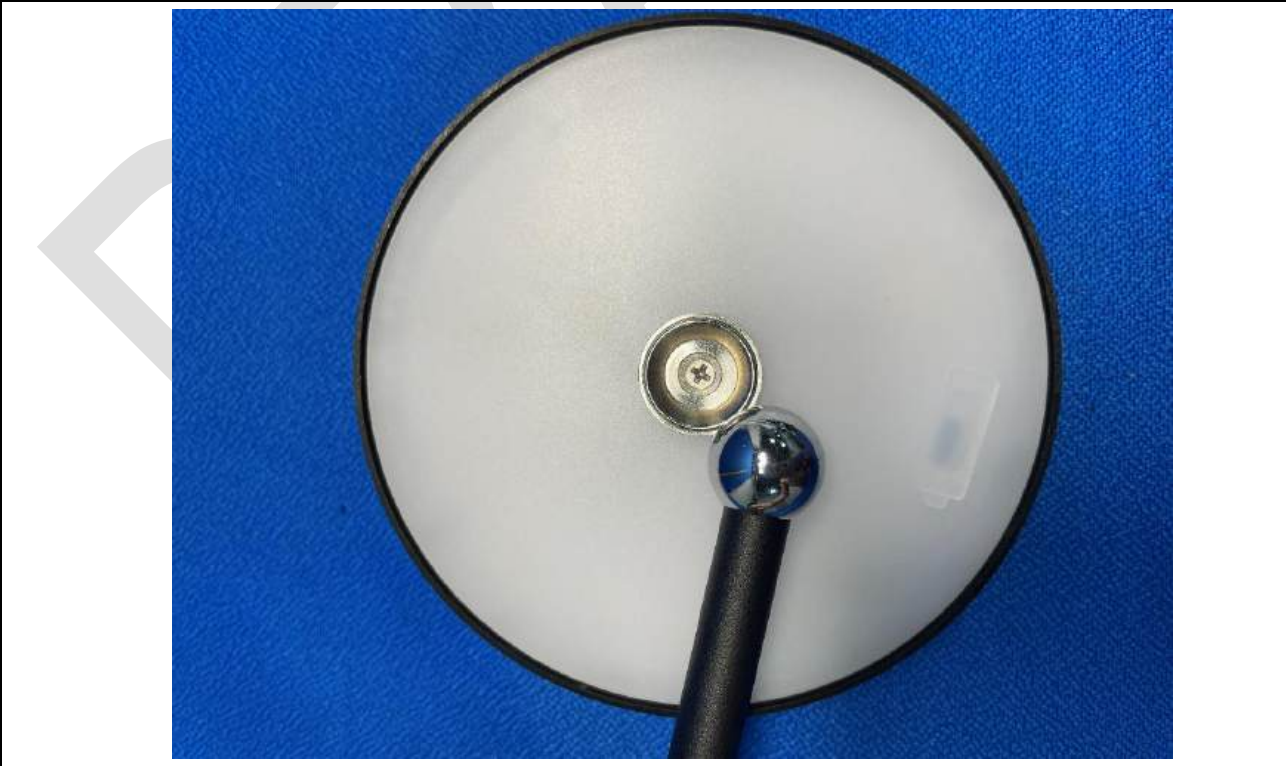
Details of: Base view for TL-RL-1003



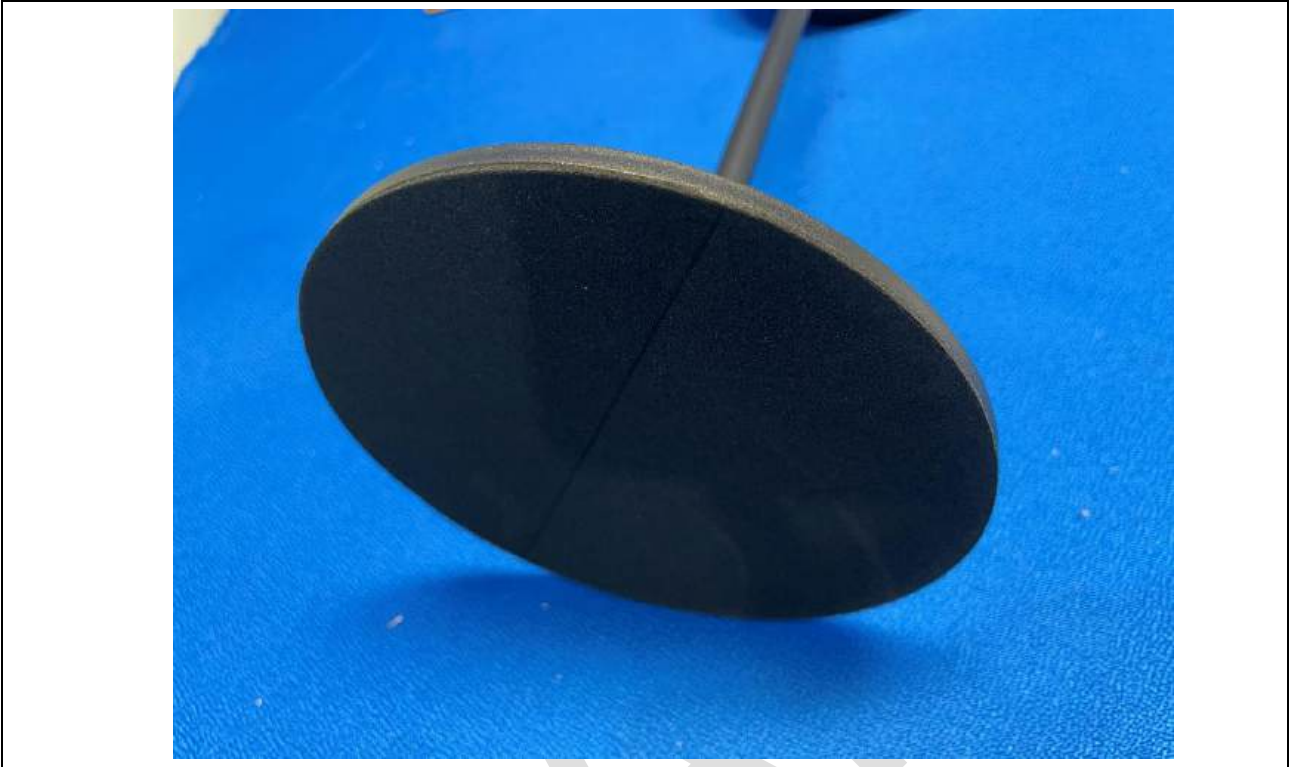
Details of: Outlook for TL-RL-1004



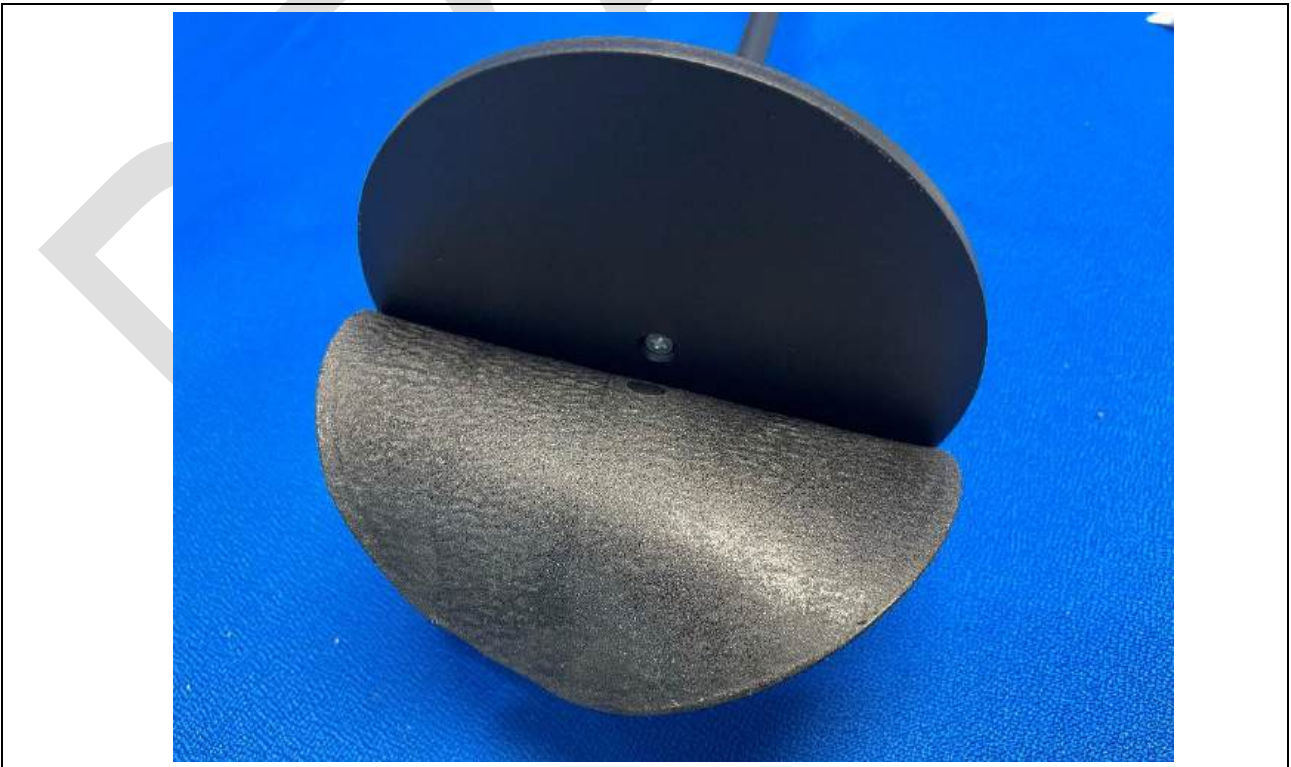
Details of: Detail view for TL-RL-1004



Details of: Base view for TL-RL-1004



Details of: Base view for TL-RL-1004





Details of: Outlook for TL-RL-1006



Details of: Detail view for TL-RL-1006



Details of: Outlook for TL-RL-1007



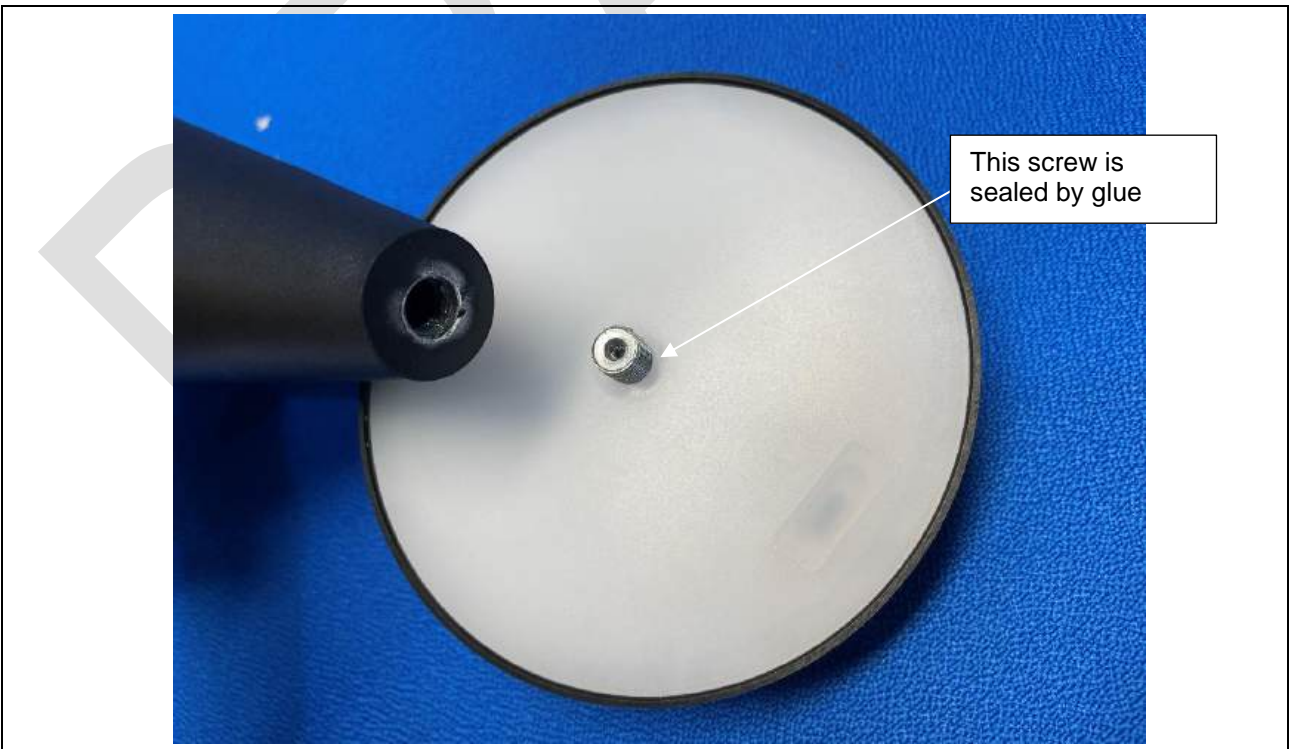
Details of: Outlook for TL-RL-1007



Details of: Base view for TL-RL-1007



Details of: Detail view for TL-RL-1007



Details of: Outlook for TL-RL-1008



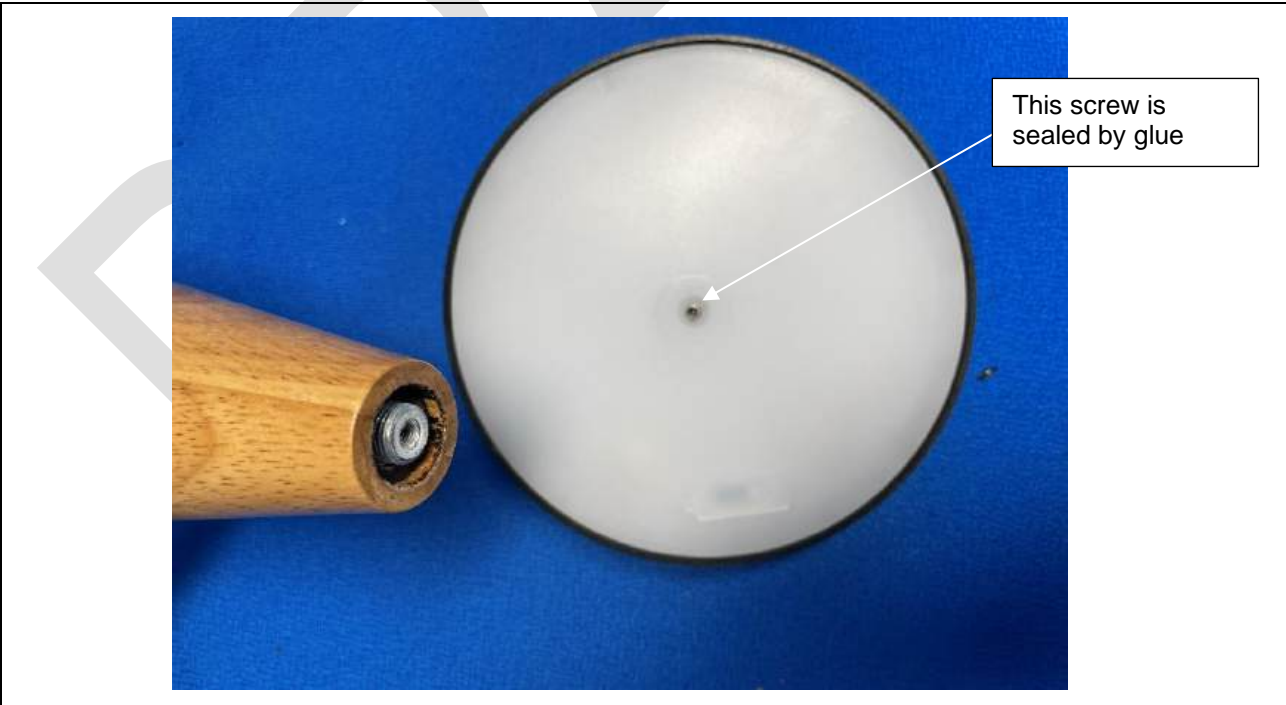
Details of: Outlook for TL-RL-1008



Details of: Base view for TL-RL-1008



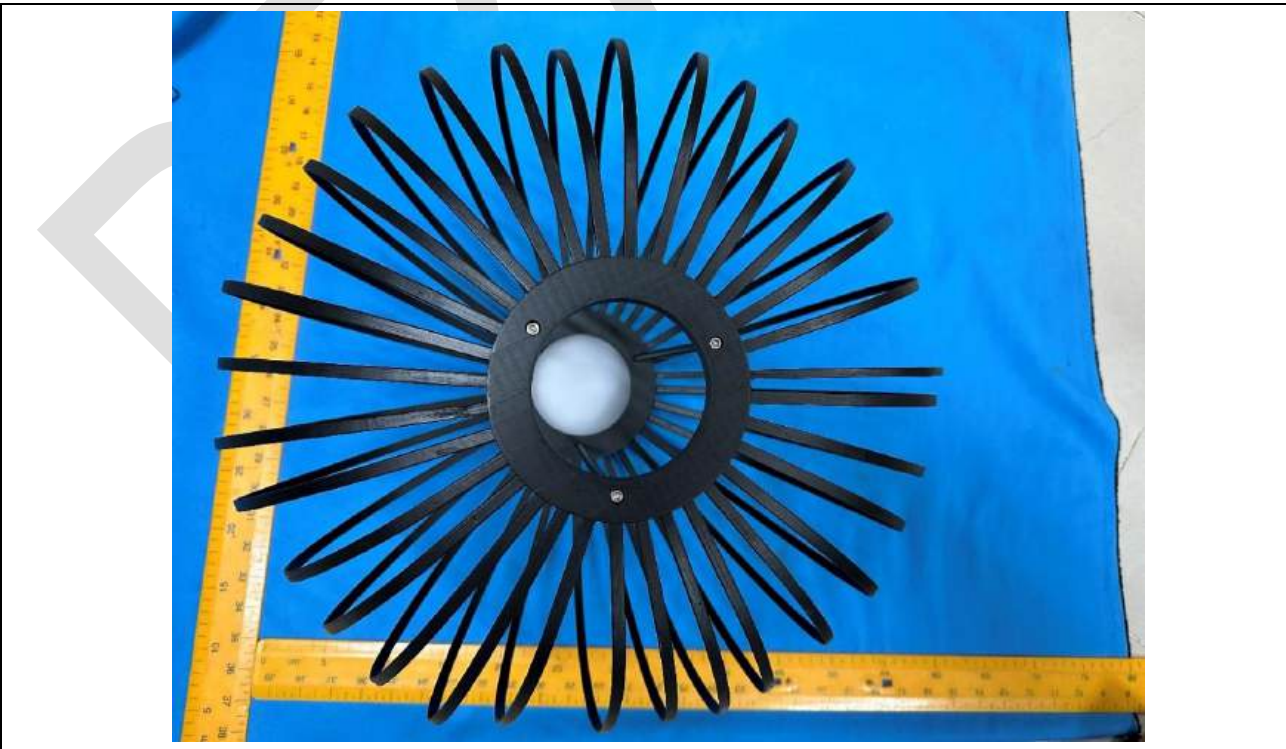
Details of: Detail view for TL-RL-1008



Details of: Outlook for TL-RL-1009, TL-RL-1010, TL-RL-1011



Details of: Outlook for TL-RL-1009, TL-RL-1010, TL-RL-1011



Details of: Exploded view for TL-RL-1009, TL-RL-1010, TL-RL-1011



Details of: Detail view for TL-RL-1009, TL-RL-1010, TL-RL-1011



Details of: Outlook for TL-RL-1012



Details of: Outlook for TL-RL-1012

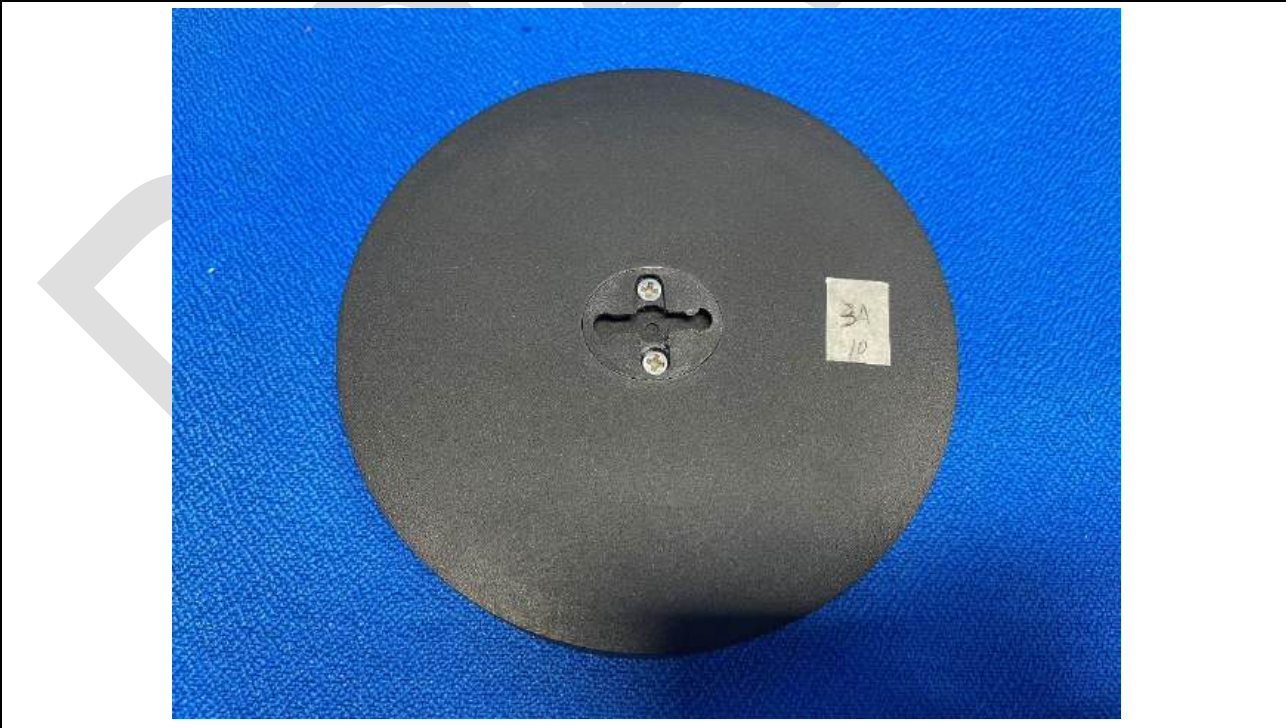




Details of: Outlook for TL-RL-1012



Details of: Detail view for TL-RL-1012



Details of: Outlook for TL-RL-1013, TL-RL-1014  
Representative model TL-RL-1014



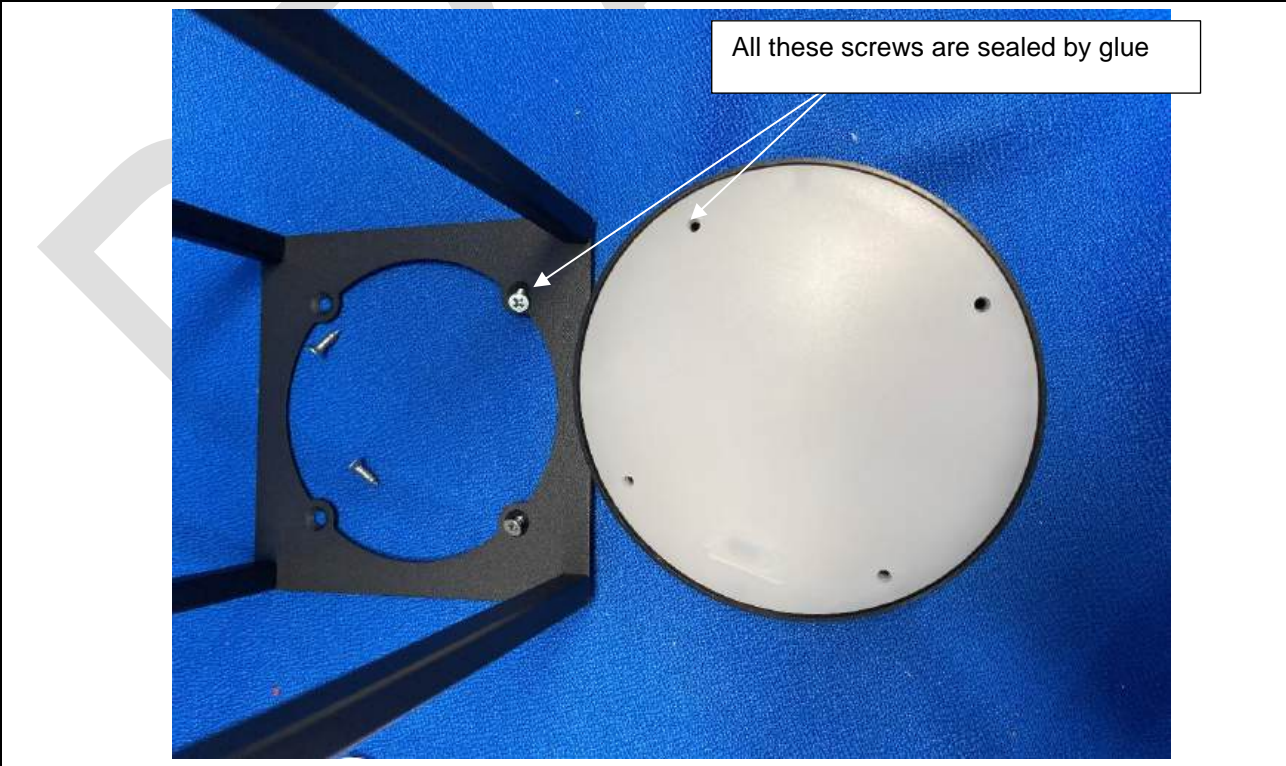
Details of: Outlook for TL-RL-1020, TL-RL-1021  
Representative model TL-RL-1021



Details of: Detail view for TL-RL-1013, TL-RL-1014, TL-RL-1020, TL-RL-1021



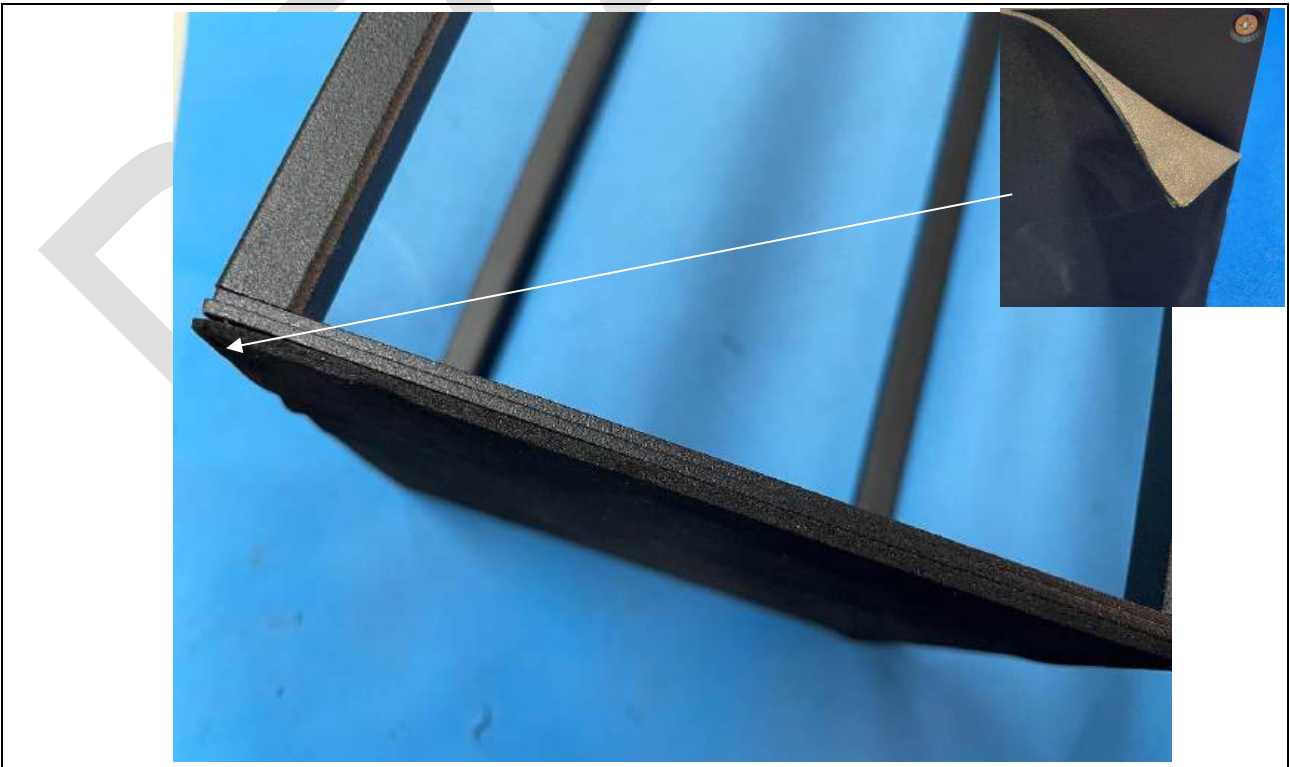
Details of: Detail view for TL-RL-1013, TL-RL-1014, TL-RL-1020, TL-RL-1021



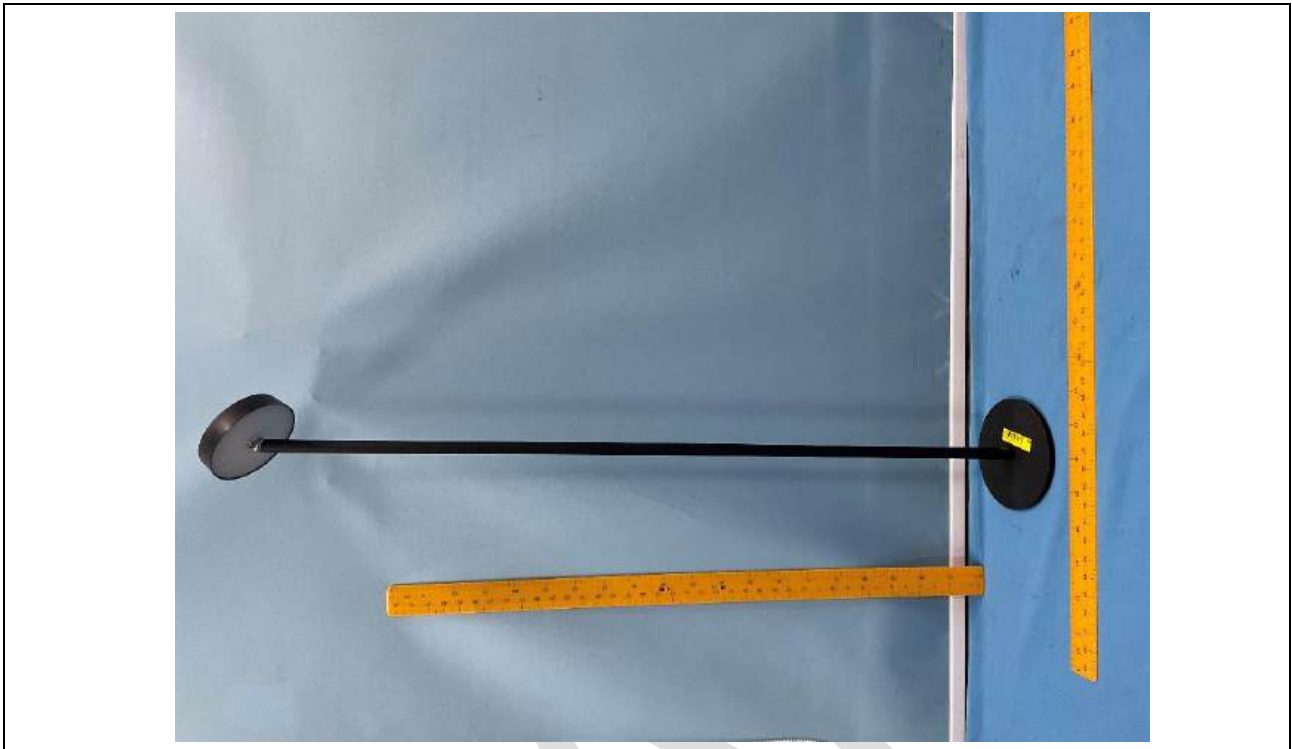
Details of: Detail view for TL-RL-1013, TL-RL-1014, TL-RL-1020, TL-RL-1021



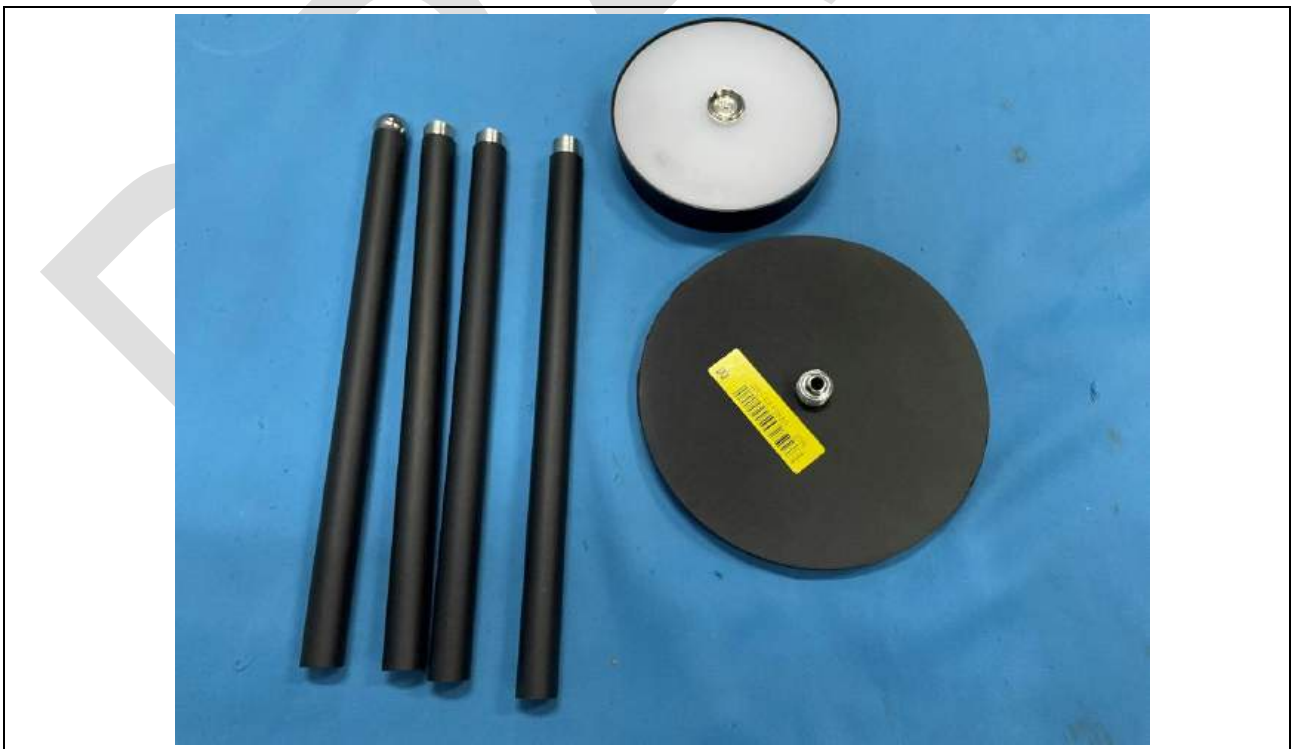
Details of: Detail view for TL-RL-1013, TL-RL-1014, TL-RL-1020, TL-RL-1021



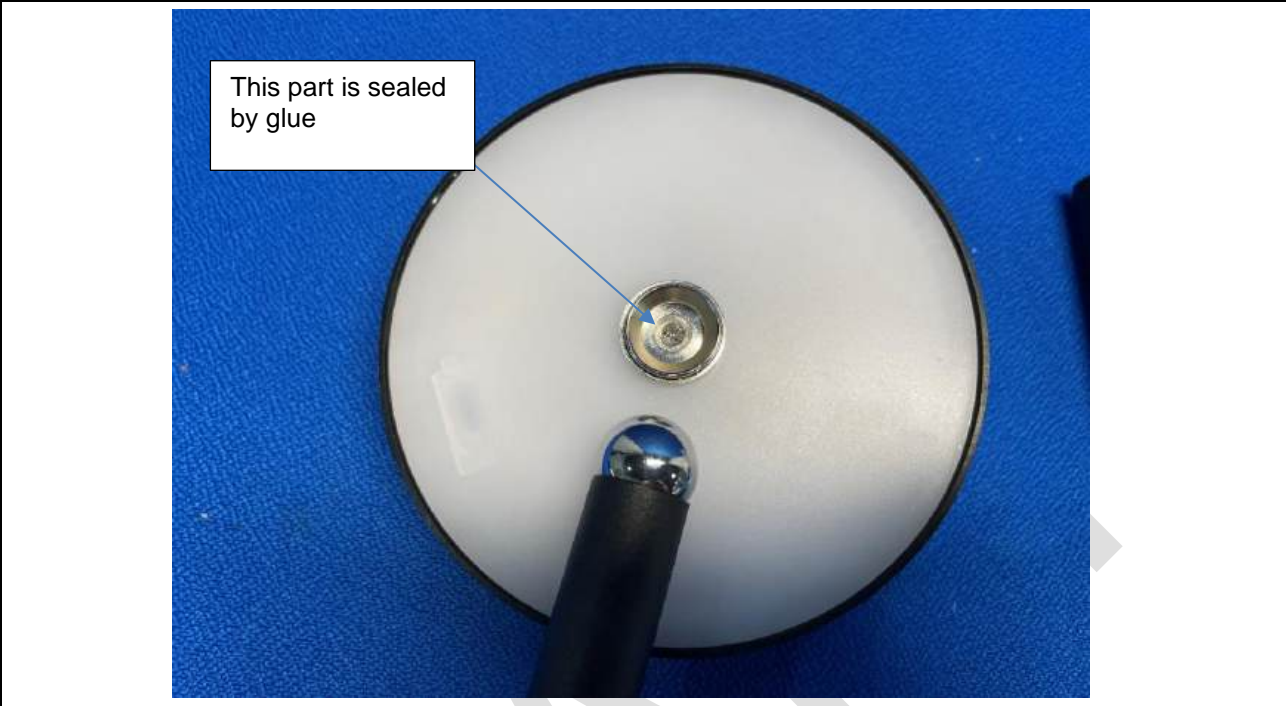
Details of: Outlook for TL-RL-1015



Details of: Exploded view for TL-RL-1015



Details of: Detail view for TL-RL-1015



Details of: Detail view for TL-RL-1015



Details of: Base view for TL-RL-1015



Details of: Base view for TL-RL-1015



Details of: Outlook for TL-RL-1016



Details of: Outlook for TL-RL-1016

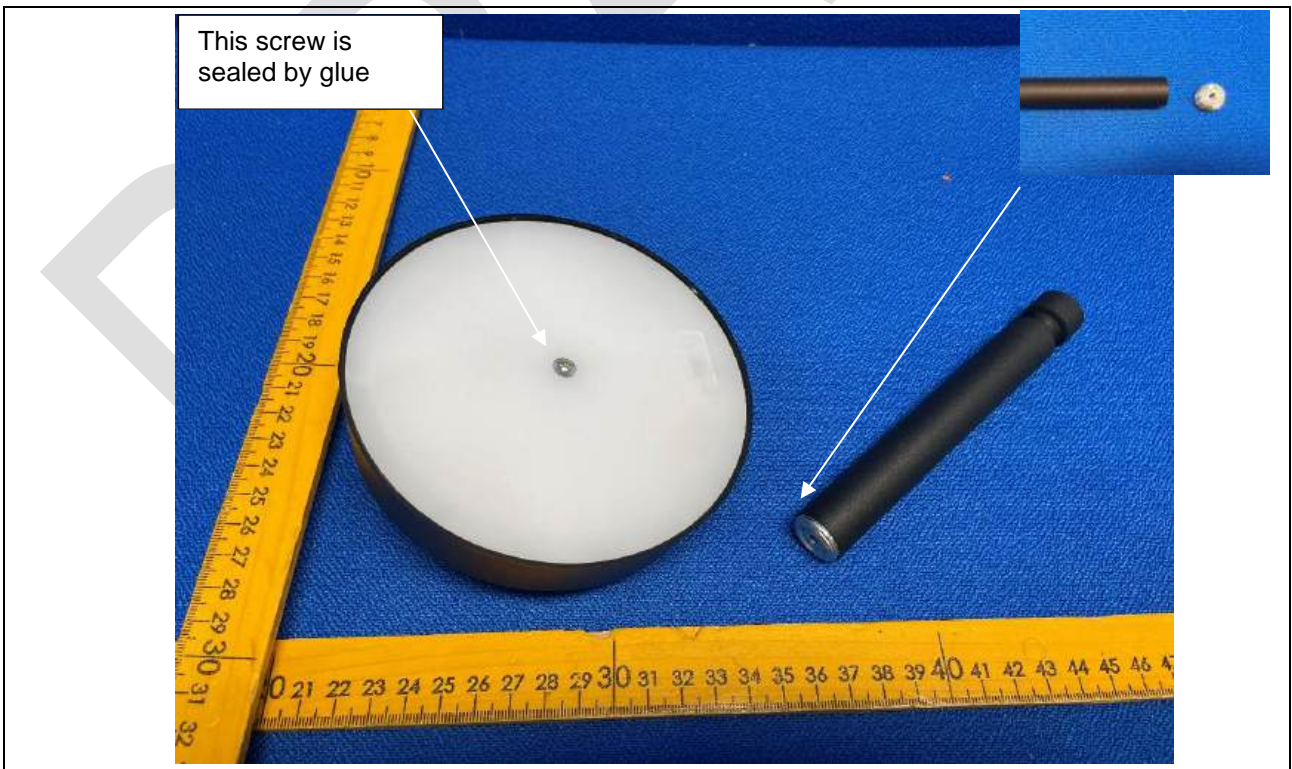




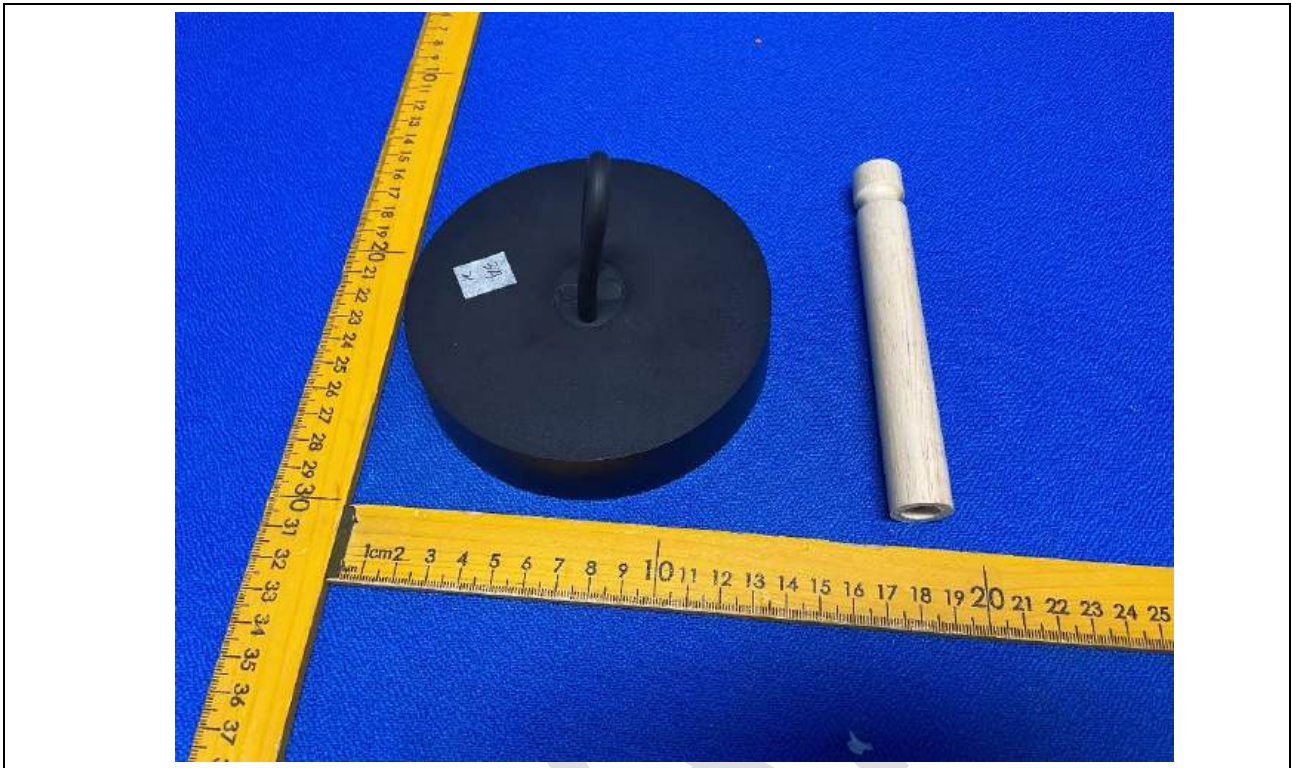
Details of: Outlook for TL-RL-1017



Details of: Outlook for TL-RL-1017



Details of: Outlook for TL-RL-1018



Details of: Outlook for TL-RL-1018



Details of: Outlook for TL-RL-1019



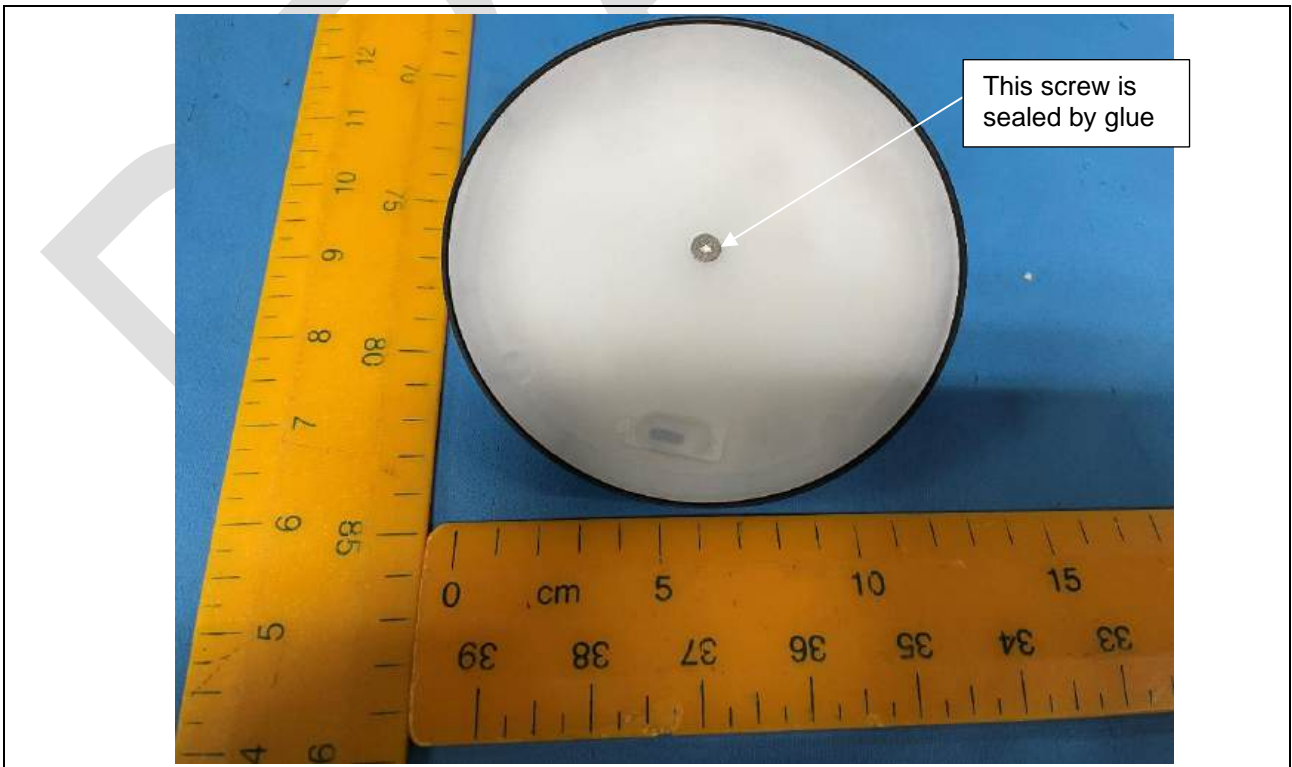
Details of: Outlook for TL-RL-1019



Details of: Outlook for TL-RL-1022



Details of: Outlook for TL-RL-1022



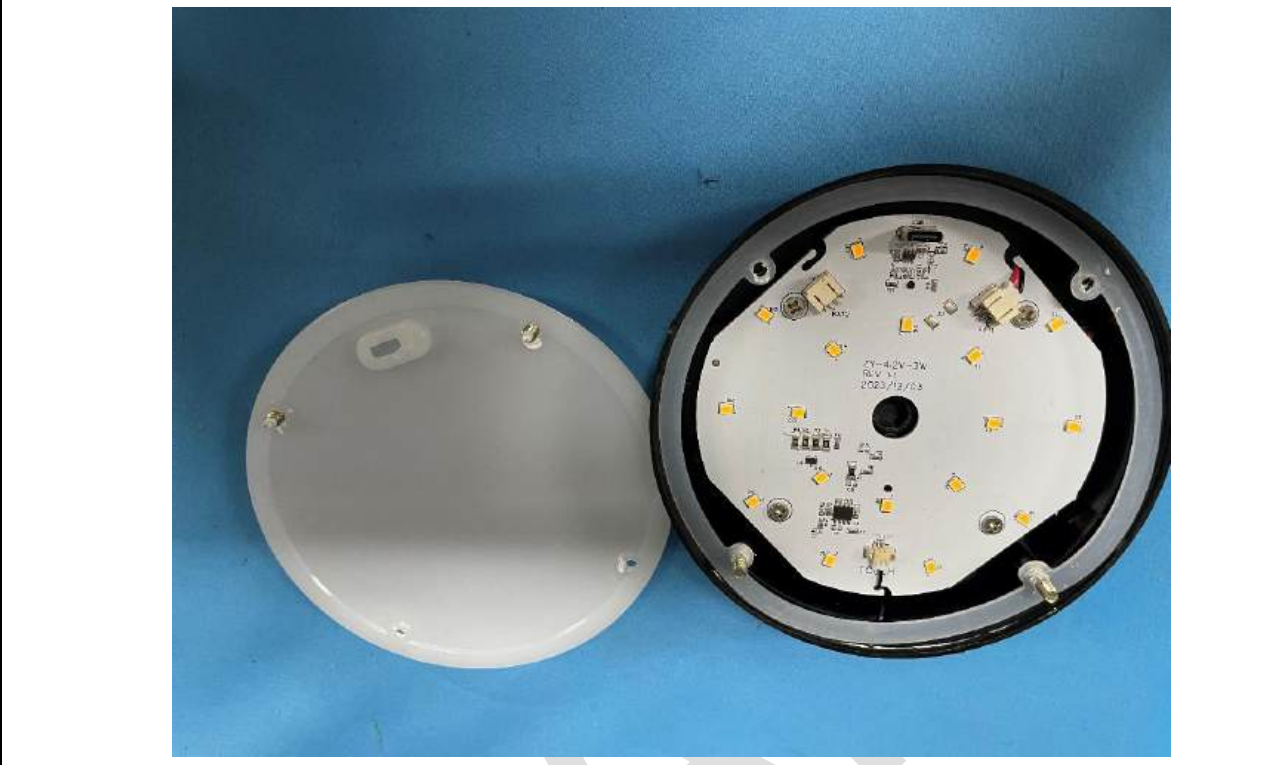
Details of: Detail view for all models



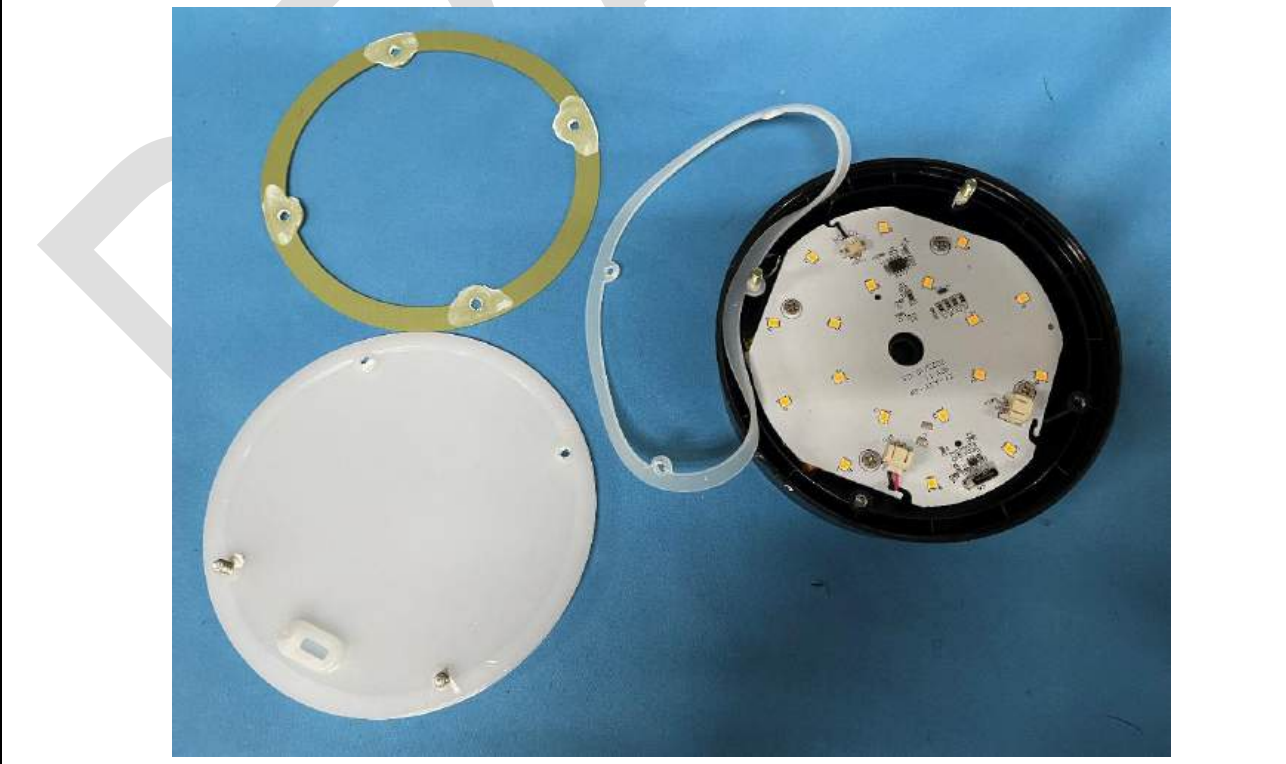
Details of: Detail view for all models



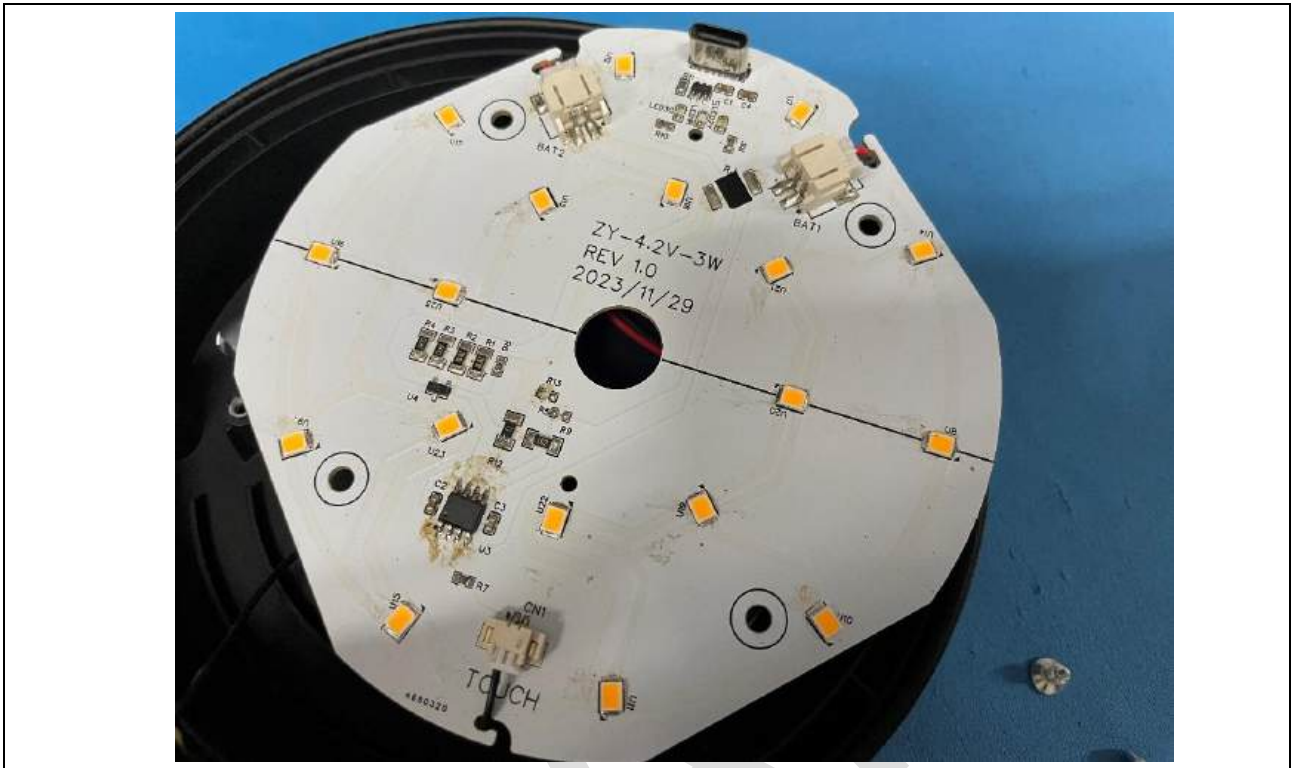
Details of: Internal view for all models  
Representative model TL-RL-1006



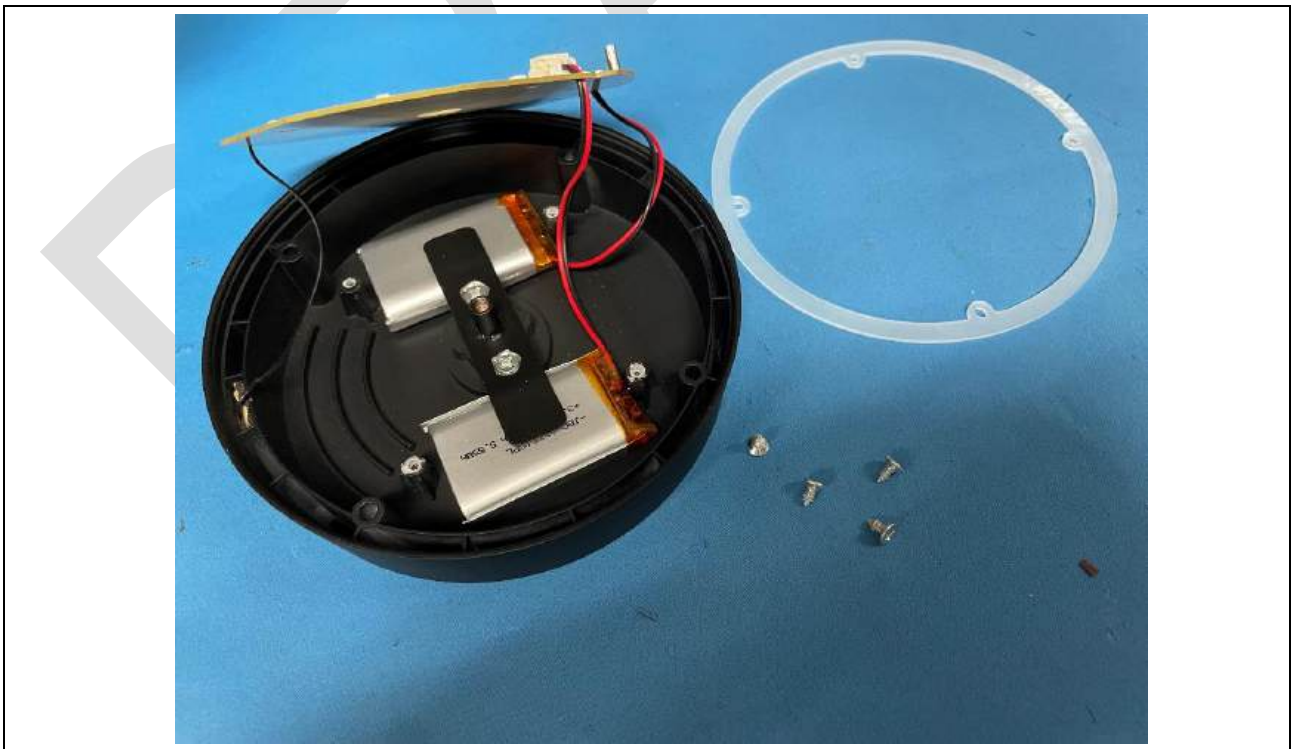
Details of: Internal view for all models  
Representative model TL-RL-1006



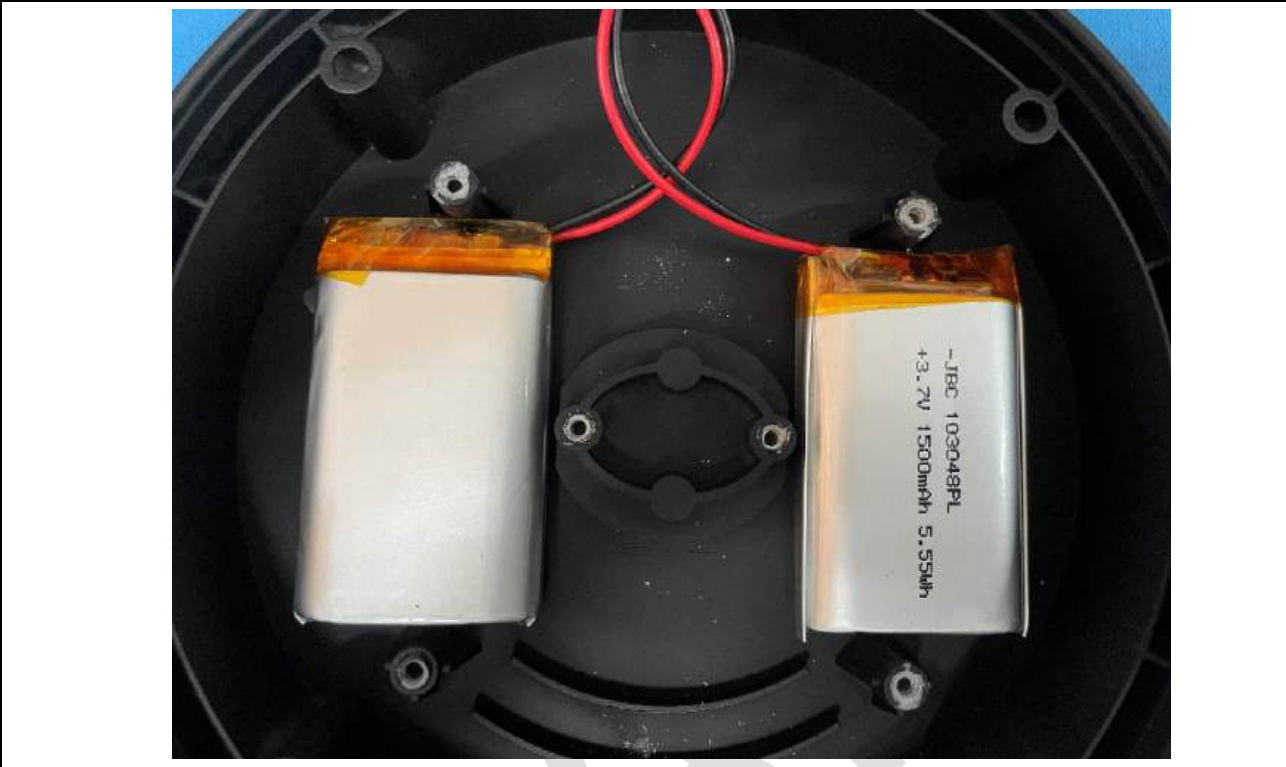
Details of: LED module view for all models



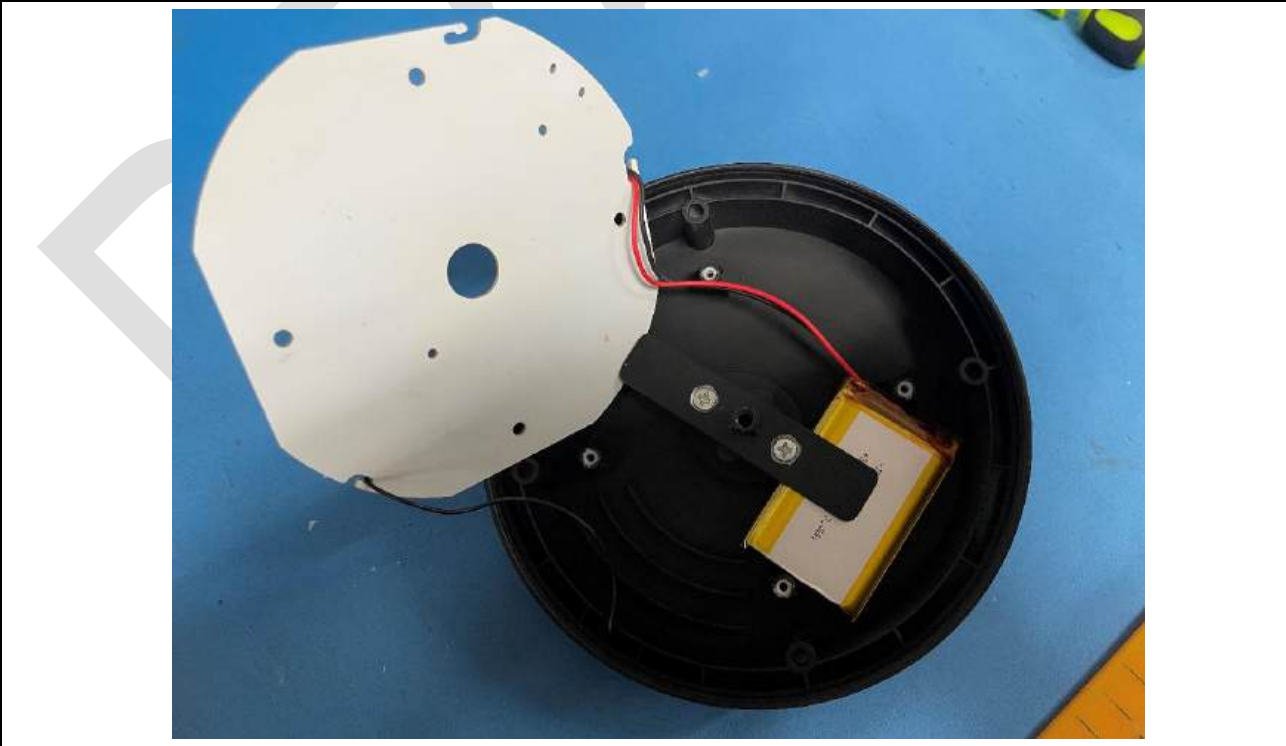
Details of: Battery view (3.7V, 2x150mAh)



Details of: Battery view (3.7V, 2x1500mAh)

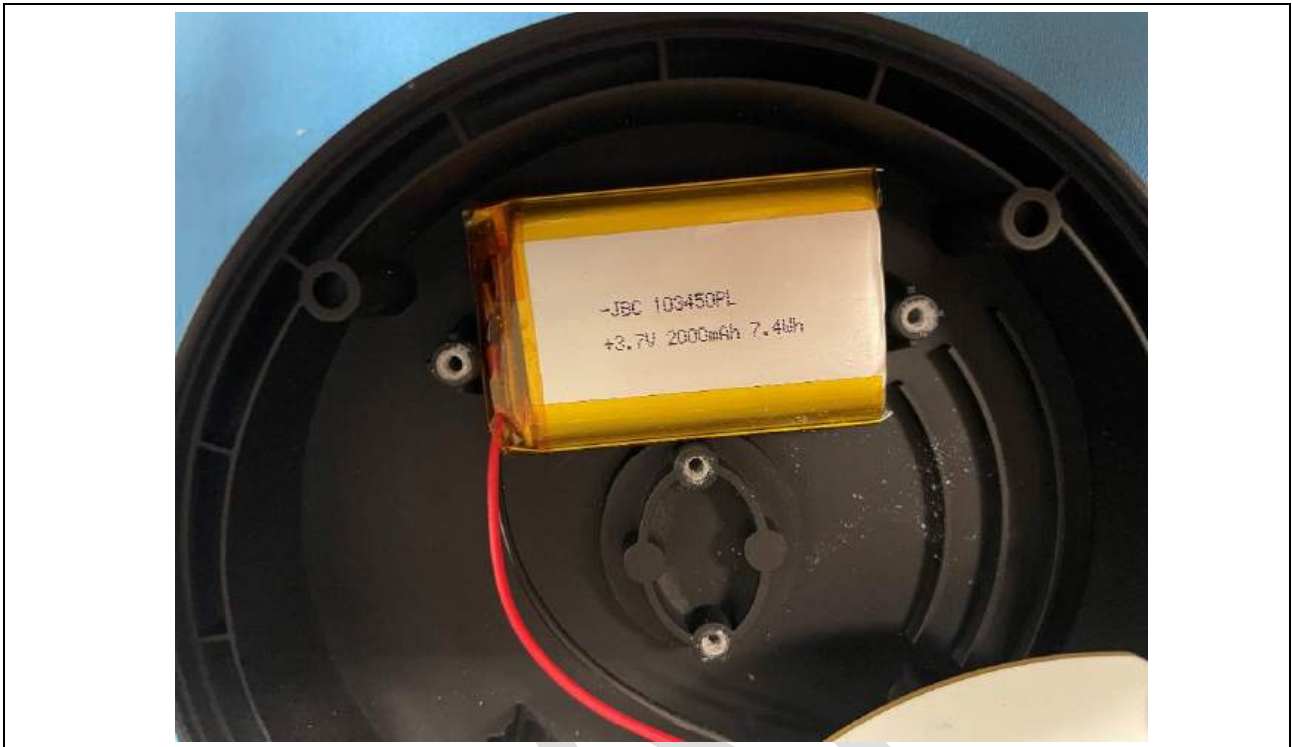


Details of: Battery view (3.7V, 2000mAh)





Details of: Battery view (3.7V, 2000mAh)



Details of: USB cord



---END OF TEST REPORT---