



# TEST REPORT

According to ANSI/IES LM-80-15

For

## Shenzhen Runlite Technology Co.,Ltd

Building A15, Tantou the 4th Industrial Estate, SongGang Town, BaoAn District, ShenZhen, China

**#Model: F5730A-401W28NN4N5FV0V7-EJ00**

<b>Report Type:</b> 6000 Hours Test Report	<b>Product Type:</b> LED Module
<b>Test Engineer:</b>	Pote Wang <i>Pote Wang</i>
<b>Report Number:</b>	RSZ190404505-10
<b>Test Date:</b>	2019-04-05 to 2019-12-15
<b>Report Date:</b>	2019-12-31
<b>Reviewed By:</b>	Bill Xiong / EE Engineer <i>Bill Xiong</i>
<b>Test Facility:</b>	Test facility was located at No.69,Pulongcun ,Puxihu Industrial Area, Tangxia , Dongguan, Guangdong, China.
<b>Prepared By:</b>	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxihu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
<b>Accreditation:</b>	The IAS Accreditation Number TL-460.

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## 1 - General Information

### 1.1 Description of LED Light Sources

#### Sample Size:

24 PCS test samples were in good condition and received on 2019-04-04. The samples were numbered from 1 to 12 and 13 to 24.

#Manufacturer:	Shenzhen Runlite Technology Co.,Ltd
#Part Number:	F5730A-401W28NN4N5FV0V7-EJ00
#Series Number:	57mm
#Part Type:	LED Module
#Drive Level:	DC 30mA
#Nominal CCT:	2700K
#Power:	3.3W
#Average Current Density per LED die:	166.072 mA/mm <sup>2</sup>
#Average Power Density per LED die:	0.457W/mm <sup>2</sup>
#CRI:	84
#Die Spacing:	1.12mm

#### Sampling Method:

LED samples for IESNA LM-80 testing consist of units built from a minimum of three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days.

These manufacturing lots are picked to represent a wide parametric distribution.

#### #Family products covered by this report:

According to *ENERGY STAR® Requirements for the Use of LM-80 Data*, the following products can be covered by this report base on the information and declaration provided by manufacturer. The information of these models shows that the covered products meet all section 4 requirements of *ENERGY STAR® Requirements for the Use of LM-80 Data* (September 28, 2017)

This report covers the following models:

Model type	Model name	CCT (typ.)	Series	Parallel	Power Density per LED die (W/mm <sup>2</sup> )	Current density per LED die (mA/mm <sup>2</sup> )	Current per die (mA)	Die Spacing (mm)	Current (mA)
Master model	F5730A-401W28NN4N5FV0V7-EJ00	2700K	40	1	0.0239	166.072	30	1.12	30
Multiple Model	F5730A-401XXXXXXXXXXXX-XXXX	2200K-6500K	40	1	0.0239	166.072	30	1.12	30
	F5730A-391XXXXXXXXXXXX-XXXX	2200K-6500K	39	1	0.0234	166.072	30	1.15	30
	F5730A-381XXXXXXXXXXXX-XXXX	2200K-6500K	38	1	0.0228	166.072	30	1.18	30
	F5730A-371XXXXXXXXXXXX-XXXX	2200K-6500K	37	1	0.0223	166.072	30	1.21	30
	F5730A-361XXXXXXXXXXXX-XXXX	2200K-6500K	36	1	0.0217	150.974	30	1.24	30
	F5730A-351XXXXXXXXXXXX-XXXX	2200K-6500K	35	1	0.0212	150.974	30	1.28	30

	F5730A-341XXXXXXXXXXXXX-XXXX	2200K-6500K	34	1	0.0207	150.974	30	1.31	30
	F5730A-331XXXXXXXXXXXXX-XXXX	2200K-6500K	33	1	0.0201	150.974	30	1.35	30
	F5730A-321XXXXXXXXXXXXX-XXXX	2200K-6500K	32	1	0.0196	150.974	30	1.39	30
	F5730A-311XXXXXXXXXXXXX-XXXX	2200K-6500K	31	1	0.0190	150.974	30	1.44	30
Multiple Model	F5730A-301XXXXXXXXXXXXX-XXXX	2200K-6500K	30	1	0.0185	150.974	30	1.48	30
	F5730A-291XXXXXXXXXXXXX-XXXX	2200K-6500K	29	1	0.0179	150.974	30	1.53	30
	F5730A-281XXXXXXXXXXXXX-XXXX	2200K-6500K	28	1	0.0174	150.974	30	1.59	30
	F5730A-271XXXXXXXXXXXXX-XXXX	2200K-6500K	27	1	0.0168	150.974	30	1.64	30
	F5730A-261XXXXXXXXXXXXX-XXXX	2200K-6500K	26	1	0.0163	150.974	30	1.70	30
	F5730A-251XXXXN0N1XXXXX-XXXX	2200K-6500K	25	1	0.0143	145.942	29	1.77	29
	F5730A-251XXXXM2M3XXXXX-XXXX	2200K-6500K	25	1	0.0143	140.469	29	1.77	29
	F5730A-251XXXXM4N0XXXXX-XXXX	2200K-6500K	25	1	0.0128	143.929	26	1.77	26
	F5730A-251XXXXM3M4XXXXX-XXXX	2200K-6500K	25	1	0.0128	130.844	26	1.77	26

## 1.2 Standards and Reference Documentations

- ANSI/IES LM-80-15: IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- CIE 127:2007: Measurement of LEDs
- ENERGY STAR® Requirements for the Use of LM-80 Data (This standard was not accredited by IAS)

## 1.3 Testing Equipment

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
1.0m integrating sphere	SENSING	SCD-20008	N/A	2019-06-28	2020-06-27
spectroradiometer	SENSING	SCD-20008	N/A	2019-06-28	2020-06-27
DC Power Supply	Hanshenpuyuan	HSPY-100-05	2013010210003	2019-07-23	2020-07-22
Standard Light Source	EVERFINE	D204	N/A	2019-07-19	2020-07-18
DC Power Supply	BACL	B25001	90020	2019-01-07	2020-01-07
Multilayer aging machine	BACL	B2-270	20015	2019-03-10	2020-03-09

Device	Manufacture	Model No	Serial No	Calibration date	Calibration due date
DC Power Supply	BACL	B12001-12	90023	2019-01-07	2020-01-07

#### 1.4 Drive Level

Samples are driven with a constant direct current (DC) during maintenance test, photometric and electrical measurement. The current value was regulated to within  $\pm 3\%$  of the specified value of the manufacturer during maintenance test, and was within  $\pm 0.5\%$  during photometric and electrical measurement test.

#### 1.5 Ambient Conditions for Maintenance Test

For lumen maintenance test, samples within one data set, were installed on cooling boards in thermal chambers with minimal ambient airflow. The case temperature and ambient temperature was monitored by thermocouples which one was soldered to the coldest DUTs' case (TMP<sub>LED</sub>) location, while the other is mounted at a distance of 5 mm above the TMP location.

During life testing, TMP<sub>LED</sub> of the coldest LEDs were maintained at a temperature that was greater than or equal to 2°C below the corresponding nominal case temperature. Surrounding air was maintained at a temperature that was greater than or equal to 5°C below the corresponding nominal case temperature. Thermocouples were shielded from direct DUT optical radiation and comply with ASTM E230 Table 1 "Special Limits".

Samples were connected to DC power supply in series circuits with a constant current. The forward current was regulated to within  $\pm 3\%$  of the specified value of the manufacturer.

The relative humidity within chamber was kept less than 65% during test.

For photometry measurement, the ambient temperature during test was set to  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , RH <65%.

#### 1.6 Photometric Measurement Method and Uncertainty

Integrating sphere and spectroradiometer is used to measure luminous flux and chromaticity coordinate u'v'. 2 $\pi$  measurement was used and sample was driven by DC power supply. The forward current was regulated to within  $\pm 0.5\%$  of the nominal value. The test system was calibrated by halogen reference lamp. The ambient temperature during test was set to  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , RH <65%. The temperature measurement point was located in the sphere and the temperature was detected by a temperature probe.

The uncertainty of the light output (luminous flux) measurements is U=2.1% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=21K (K=2), at the 95% confidence level. The uncertainty of the CRI is U=2.1 (K=2), at the 95% confidence level.

The uncertainty of the temperature is U=0.8671°C (K=2), at the 95% confidence level.

#### 1.7 Statement of Traceability

Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

## 1.8 Sample Set

### Data Set 1: 85°C, 30mA

Part Number: F5730A-401W28NN4N5FV0V7-EJ00

Number of Units: 12

Case Temperature: >83°C

Ambient Temperature: >80°C

Life Test Drive Current: 30mA

Measurement Current: 30mA

### Data Set 2: 115°C, 30mA

Part Number: F5730A-401W28NN4N5FV0V7-EJ00

Number of Units: 12

Case Temperature: >113°C

Ambient Temperature: >110°C

Life Test Drive Current: 30mA

Measurement Current: 30mA

FINAL

## 2 - Summary of Test Result

Data Set:	Sample Size	Failures Observed:	Test Interval	Test Duration	$\alpha$	$\beta$	Reported TM-21 L <sub>70</sub> Lifetime	Reported TM-21 L <sub>90</sub> Lifetime
1	12	0	1000hrs	6000hrs	9.117E-06	1.002	>33000 hours	12,000 hours
2	12	0	1000hrs	6000hrs	1.042E-05	1.000	>33000 hours	10,000 hours

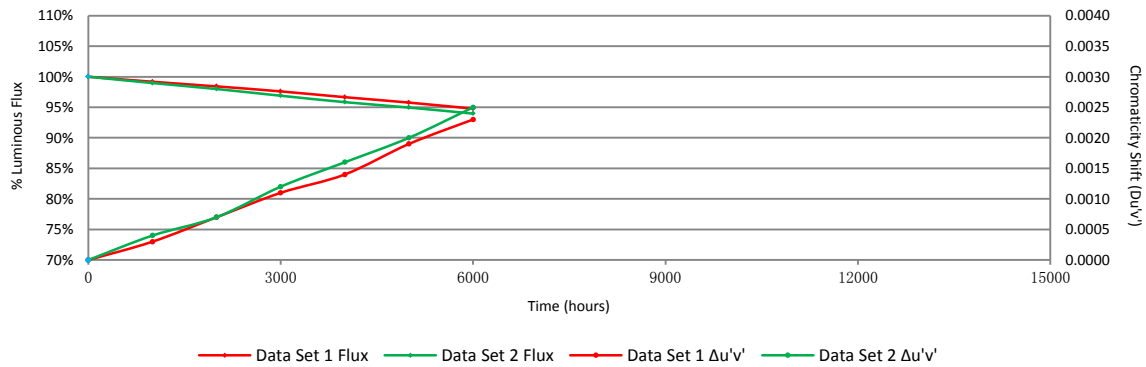
Average Lumen Maintenance (Percentage of Initial Luminous Flux)

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	99.18%	98.42%	97.60%	96.65%	95.77%	94.77%
2	98.97%	97.99%	96.89%	95.84%	94.96%	93.96%

Average Chromaticity Shift

Data Set:	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.0003	0.0007	0.0011	0.0014	0.0019	0.0023
2	0.0004	0.0007	0.0012	0.0016	0.002	0.0025

Average Lumen Maintenance and Chromaticity Shift VS. Time



### 3 - Test Data

#### 3.1 Data Set 1, 85°C, 30mA (Lumen Maintenance)

No.	Φ(lm)	Lumen Maintenance (%)					
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	566.33	99.19	98.01	97.68	96.81	95.32	94.58
2	566.33	99.24	98.68	97.68	96.81	96.36	95.61
3	560.49	99.25	97.93	97.66	96.78	95.28	94.53
4	572.17	98.84	97.91	97.70	96.85	95.37	94.64
5	560.49	99.46	97.90	97.66	95.74	96.32	94.53
6	572.17	99.16	98.73	97.70	96.85	95.37	94.64
7	578.00	99.41	97.76	96.72	95.87	95.42	94.69
8	572.17	99.13	98.92	97.70	96.85	96.39	95.66
9	560.49	99.12	99.01	97.66	96.78	96.32	94.53
10	578.00	99.05	98.21	97.73	96.88	95.42	94.69
11	572.17	99.16	99.02	97.70	96.85	95.37	94.64
12	554.65	99.17	98.96	97.63	96.75	96.28	94.47
Avg.	567.79	99.18	98.42	97.60	96.65	95.77	94.77
Med.	569.25	99.16	98.45	97.68	96.81	95.42	94.64
st dev	7.52	0.16	0.51	0.28	0.40	0.50	0.41
Min.	554.65	98.84	97.76	96.72	95.74	95.28	94.47
Max.	578.00	99.46	99.02	97.73	96.88	96.39	95.66



**3.2 Data Set 1, 85°C, 30mA (Forward Voltage)**

No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	111.77	111.70	111.53	111.44	111.34	111.16	111.27
2	111.49	111.27	111.10	111.02	110.97	110.93	110.82
3	111.89	111.69	111.54	111.38	111.18	111.07	111.05
4	112.83	112.09	111.93	111.66	111.55	111.41	111.38
5	111.47	111.30	111.19	110.98	110.85	110.81	110.70
6	111.94	111.78	111.53	111.44	111.27	111.14	111.07
7	112.37	112.08	111.91	111.77	111.73	111.66	111.51
8	111.76	111.64	111.45	111.27	111.21	111.12	110.96
9	111.49	111.23	111.09	110.93	110.85	110.74	110.58
10	111.35	111.24	111.10	110.97	110.84	110.69	110.58
11	111.66	111.48	111.30	111.20	111.00	110.92	110.90
12	111.86	111.58	111.40	111.30	111.10	111.00	110.96
Avg.	111.82	111.59	111.42	111.28	111.16	111.05	110.98
Med.	111.77	111.61	111.43	111.29	111.14	111.04	110.96
st dev	0.42	0.30	0.29	0.27	0.28	0.28	0.30
Min.	111.35	111.23	111.09	110.93	110.84	110.69	110.58
Max.	112.83	112.09	111.93	111.77	111.73	111.66	111.51

**3.3 Data Set 1, 85°C, 30mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
1	0.2564	0.5271	2832	0.0005	0.0011	0.0016	0.0020	0.0024	0.0028
2	0.2564	0.5270	2832	0.0002	0.0006	0.0010	0.0013	0.0018	0.0022
3	0.2553	0.5265	2860	0.0002	0.0007	0.0010	0.0013	0.0019	0.0023
4	0.2544	0.5254	2884	0.0001	0.0007	0.0011	0.0014	0.0018	0.0021
5	0.2560	0.5256	2850	0.0003	0.0006	0.0010	0.0013	0.0020	0.0022
6	0.2558	0.5269	2846	0.0004	0.0007	0.0011	0.0014	0.0019	0.0023
7	0.2563	0.5253	2844	0.0003	0.0006	0.0011	0.0013	0.0017	0.0021
8	0.2564	0.5273	2832	0.0005	0.0007	0.0010	0.0014	0.0019	0.0023
9	0.2567	0.5274	2824	0.0002	0.0006	0.0009	0.0015	0.0017	0.0022
10	0.2567	0.5278	2822	0.0004	0.0007	0.0011	0.0014	0.0019	0.0023
11	0.2563	0.5264	2838	0.0003	0.0007	0.0010	0.0014	0.0018	0.0022
12	0.2554	0.5258	2862	0.0001	0.0005	0.0009	0.0014	0.0018	0.0023
Avg.	0.2560	0.5265	2844	0.0003	0.0007	0.0011	0.0014	0.0019	0.0023
Med.	0.2563	0.5267	2841	0.0003	0.0007	0.0010	0.0014	0.0018	0.0023
st dev	0.0007	0.0008	18	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002
Min.	0.2544	0.5253	2822	0.0001	0.0005	0.0009	0.0013	0.0017	0.0021
Max.	0.2567	0.5278	2884	0.0005	0.0011	0.0016	0.0020	0.0024	0.0028

**3.4 Data Set 2, 115°C, 30mA (Lumen Maintenance)**

No.	Φ(lm)	Lumen Maintenance (%)					
	Ohr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
13	560.49	99.20	97.87	97.11	96.04	95.58	94.67
14	578.00	98.21	97.94	96.19	95.15	94.70	93.83
15	560.49	99.20	97.87	97.11	96.04	94.54	93.63
16	560.49	99.23	97.87	96.06	96.04	94.54	93.63
17	560.49	99.20	97.87	97.11	96.04	94.54	93.63
18	578.00	98.21	97.94	97.20	96.16	94.70	93.83
19	578.00	98.21	97.94	97.20	95.15	94.70	93.83
20	566.33	99.21	97.89	97.14	96.08	95.62	94.73
21	578.00	99.22	97.94	97.20	96.16	94.70	93.83
22	572.17	99.21	98.93	97.17	96.12	95.67	93.76
23	572.17	99.21	97.91	97.17	96.12	95.67	93.76
24	560.49	99.37	97.87	96.06	95.00	94.54	94.37
Avg.	568.76	98.97	97.99	96.89	95.84	94.96	93.96
Med.	569.25	99.20	97.90	97.12	96.04	94.70	93.83
st dev	8.05	0.46	0.30	0.48	0.45	0.51	0.40
Min.	560.49	98.21	97.87	96.06	95.00	94.54	93.63
Max.	578.00	99.37	98.93	97.20	96.16	95.67	94.73

**3.5 Data Set 2, 115°C, 30mA (Forward Voltage)**

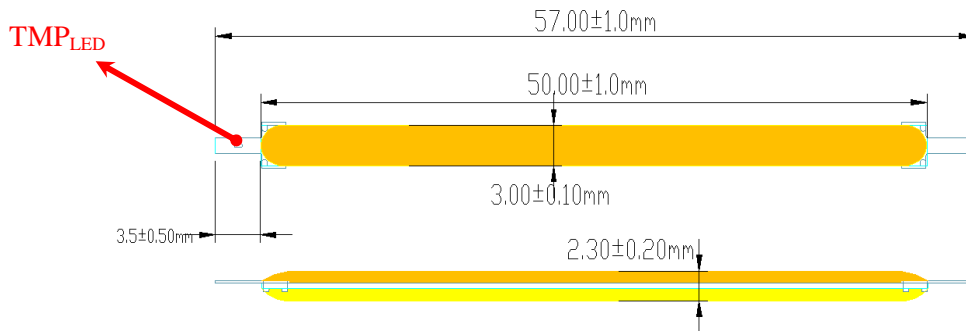
No.	Forward Voltage (V)						
	0hr(Initial)	1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
13	111.74	111.49	111.34	111.18	111.09	111.06	110.96
14	112.32	112.13	111.93	111.79	111.72	111.67	111.60
15	112.03	111.80	111.60	111.46	111.24	111.17	111.07
16	111.75	111.46	111.36	111.21	111.01	110.96	111.12
17	111.81	111.60	111.47	111.37	111.21	111.07	110.94
18	111.51	111.29	111.12	110.99	110.95	110.79	110.70
19	112.50	112.24	112.06	111.86	111.76	111.62	111.56
20	111.63	111.43	111.26	111.09	111.04	110.89	110.90
21	111.93	111.69	111.53	111.35	111.30	111.16	111.11
22	111.52	111.24	111.15	110.96	110.89	110.85	110.67
23	111.63	111.49	111.29	111.16	110.94	110.90	110.79
24	112.02	111.75	111.62	111.45	111.28	111.15	111.09
Avg.	111.87	111.63	111.48	111.32	111.20	111.11	111.04
Med.	111.78	111.55	111.42	111.28	111.15	111.07	111.02
st dev	0.31	0.31	0.29	0.29	0.29	0.28	0.29
Min.	111.51	111.24	111.12	110.96	110.89	110.79	110.67
Max.	112.50	112.24	112.06	111.86	111.76	111.67	111.60

**3.6 Data Set 2, 115°C, 30mA (Chromaticity Shift)**

No.	u'	v'	CCT(K)	Chromaticity Shift ( $\Delta u'v'$ )					
	0hr(Initial)			1000hrs	2000hrs	3000hrs	4000hrs	5000hrs	6000hrs
13	0.2561	0.5274	2836	0.0003	0.0006	0.0011	0.0015	0.0019	0.0023
14	0.2562	0.5252	2844	0.0004	0.0006	0.0012	0.0015	0.0019	0.0024
15	0.2561	0.5265	2842	0.0005	0.0008	0.0013	0.0017	0.0022	0.0027
16	0.2550	0.5258	2870	0.0004	0.0007	0.0012	0.0015	0.0020	0.0024
17	0.2555	0.5251	2864	0.0005	0.0008	0.0011	0.0015	0.0020	0.0026
18	0.2558	0.5261	2852	0.0004	0.0007	0.0011	0.0016	0.0020	0.0024
19	0.2560	0.5265	2844	0.0004	0.0007	0.0012	0.0016	0.0018	0.0024
20	0.2547	0.5251	2880	0.0005	0.0009	0.0013	0.0016	0.0023	0.0026
21	0.2557	0.5263	2852	0.0005	0.0009	0.0012	0.0016	0.0021	0.0026
22	0.2552	0.5262	2864	0.0004	0.0006	0.0014	0.0017	0.0021	0.0026
23	0.2557	0.5261	2852	0.0004	0.0007	0.0013	0.0017	0.0020	0.0026
24	0.2557	0.5263	2852	0.0004	0.0006	0.0012	0.0016	0.0020	0.0026
Avg.	0.2556	0.5261	2854	0.0004	0.0007	0.0012	0.0016	0.0020	0.0025
Med.	0.2557	0.5262	2852	0.0004	0.0007	0.0012	0.0016	0.0020	0.0026
st dev	0.0005	0.0007	13	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Min.	0.2547	0.5251	2836	0.0003	0.0006	0.0011	0.0015	0.0018	0.0023
Max.	0.2562	0.5274	2880	0.0005	0.0009	0.0014	0.0017	0.0023	0.0027

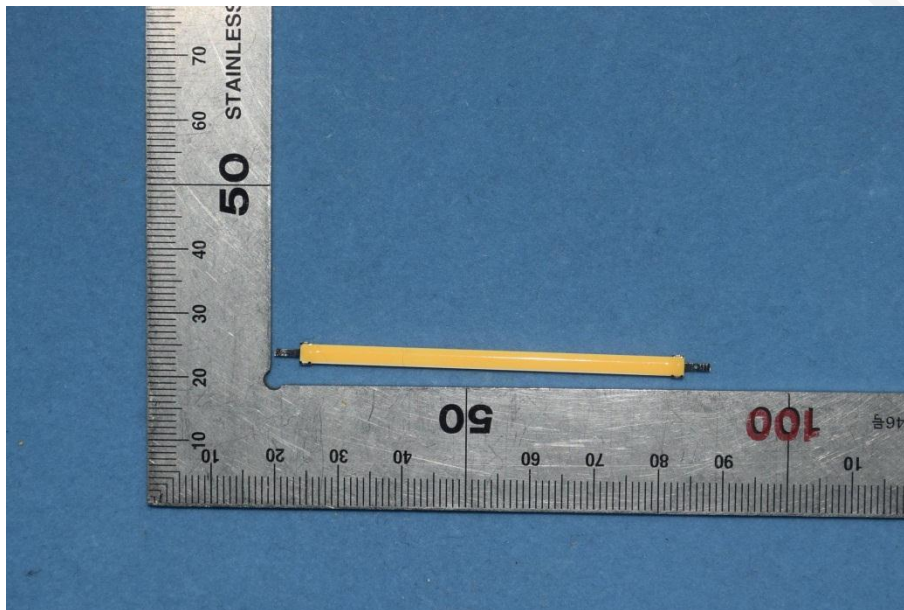
#### 4 - DUT Photo

##### 4.1 #Mechanical Dimensions



All dimensions are in millimeter

##### 4.2 DUT Photo



### Directions

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1. The information marked "superscript #" is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
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