LM-79-08 Test Report

For

RAB LIGHTING INC

(Brand Name: N/A)

170 Ludlow Ave,PO BOX 970,Northvale, NJ 07647-2305 USA

Model name(s): CRX4

Report Type:	Testing and Report According to IES LM-79-2008
Type of Luminaire:	Downlights
Report Date:	2024-07-12

Prepared By:

Test & Report By:

Engineer: Sun Fangfang

Review By:

Manager: Huang Qichong

1.1 Rated Values:	
Rated Voltage / Frequency	120V-277Vac, 60 Hz
Nominal Power	20.0W/16.0W/12.0 W
Rated Initial Lamp Lumen	2000lm/1600lm/1200lm（mode2700K）
Declared CCT	2700K/3000K/3500K/4000K/5000K

1.2 Test Specifications:

Test item	1. Total Luminous Flux 2. Luminous Distribution Intensity 3. Luminous Efficacy 4. Correlated Color Temperature 5. Color Rendering Index 6. Chromaticity Coordinate 7. Electrical Parameters
Reference Standard	1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products 2. ANSI C78.377-2015 Specifications for the Chromaticity of Solid State Lighting Products 3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources 4. CIE 15-2004 Technical Report Colorimetry 5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source 6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems
Reference Work Instruction	QD25

1.3 Test Methods

1) Photometric and Light Distribution Measurement – Goniophotometer Method:
Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at 25°C ±1°C, measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1°vertical intervals and 22.5°horizontal intervals.

2) Chromaticity Measurement – Sphere-Spectroradiometer Method:
Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25ºC ±1ºC. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm

3) Electrical Measurements:
Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at 25ºC ±1ºC. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.

2.1.1 Electrical, Photometric and Chromaticity Measurements

Test date	2024-07-10	**Test Ambient:**	25.1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	CRX4	2700K	

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
202407020002	120.0	60	0.165	19.80	0.996

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	2716
Duv	-0.0001
Chromaticity (x, y)	x=0.4584 y=0.4100
Chromaticity (u', v')	u'=0.2618 v'=0.5269
Color Rendering Index (CRI)	95.9
R9	67
Rg	100
Rf	92
Rcs,h1%	-5

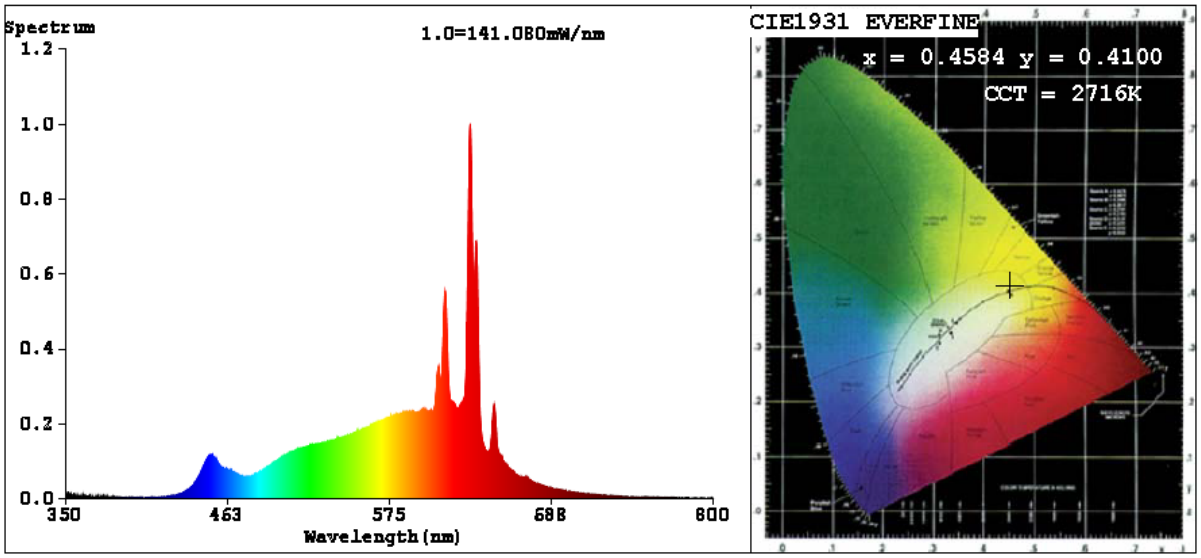
Special Color Rendering Indices			
R1	99	R9	67
R2	100	R10	98
R3	99	R11	97
R4	99	R12	90
R5	99	R13	99
R6	95	R14	98
R7	92	R15	93
R8	85	--	--

Photometric Measurement – Goniophotometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Total Luminous (lm)	2049.3
Luminous Efficacy (lm/W)	103.50
Beam Angle (°)	80.5
Center Beam Candle Power (cd)	1170.0

Parameter	Result
Test Voltage (V)	277.0
Frequency (Hz)	60
Total Luminous (lm)	2017.0
Luminous Efficacy (lm/W)	101.77

Spectral Power Distribution & Chromaticity Diagram



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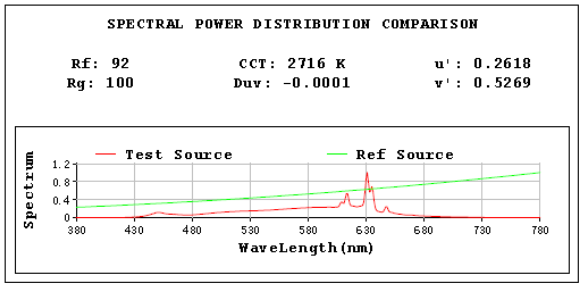
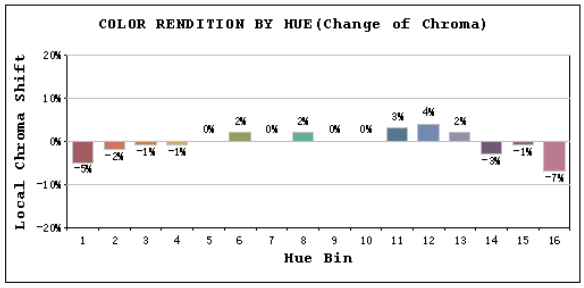
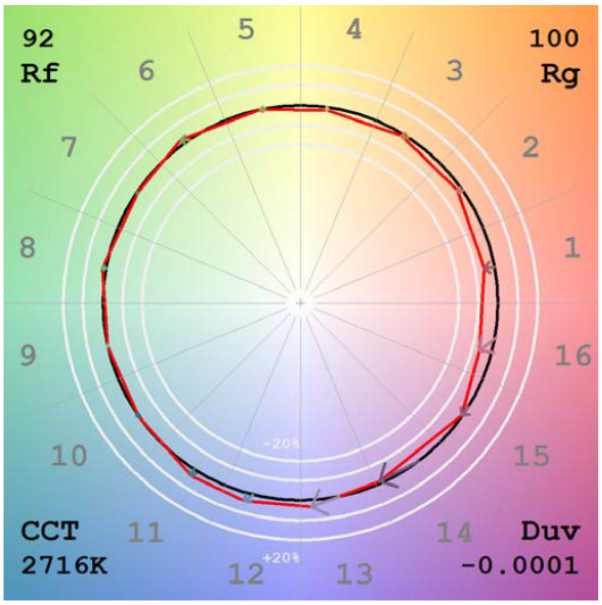
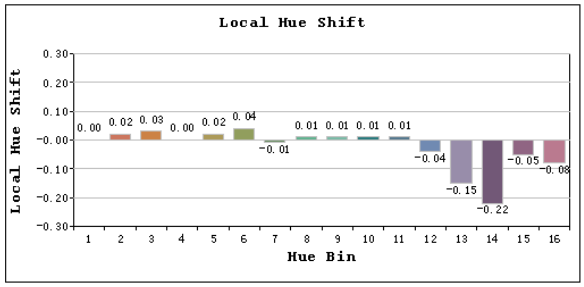
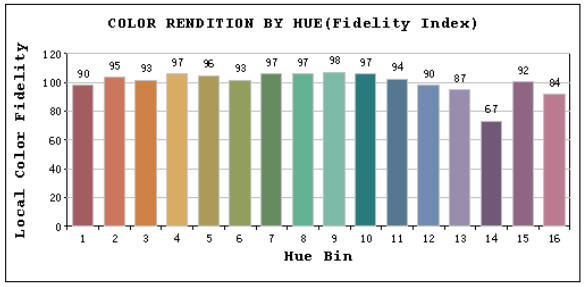
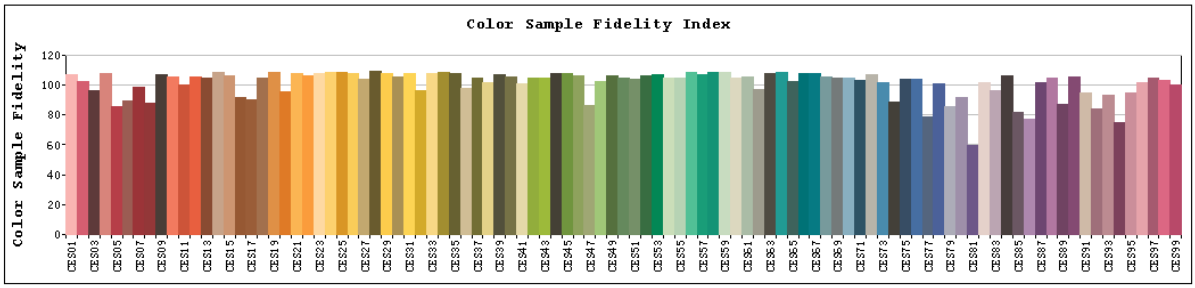

SPECTRAL POWER DISTRIBUTION COMPARISON
Rf: 92
Rg: 100
CCT: 2716 K
Duv: -0.0001
u': 0.2618
v': 0.5269
Test Source
Ref Source
Spectrum
WaveLength(nm)


COLOR RENDITION BY HUE(Change of Chroma)
Local Chroma Shift
Hue Bin


92
Rf
100
Rg
CCT
2716K
Duv
-0.0001


Local Hue Shift
Local Hue Shift
Hue Bin


COLOR RENDITION BY HUE(Fidelity Index)
Local Color Fidelity
Hue Bin

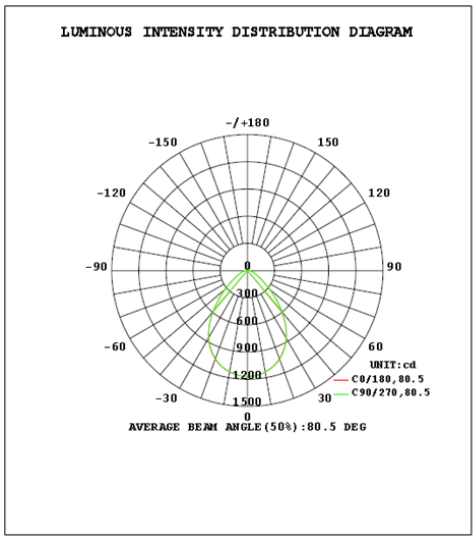

Color Sample Fidelity Index
Color Sample Fidelity

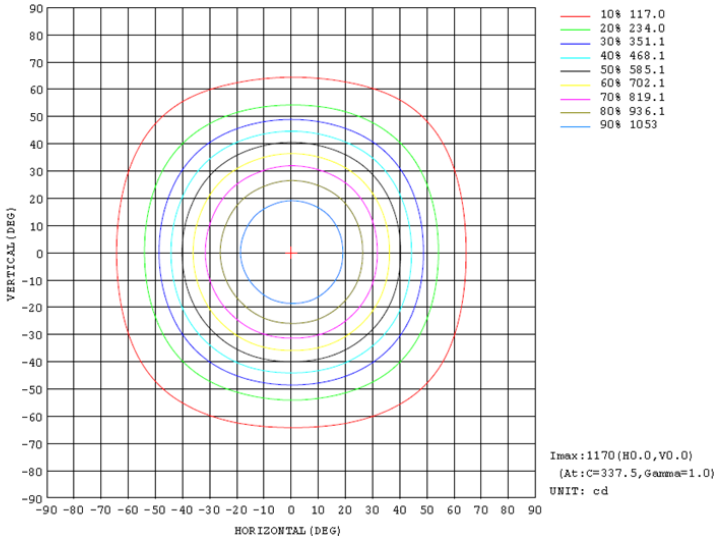
Zonal Lumen Tabulation

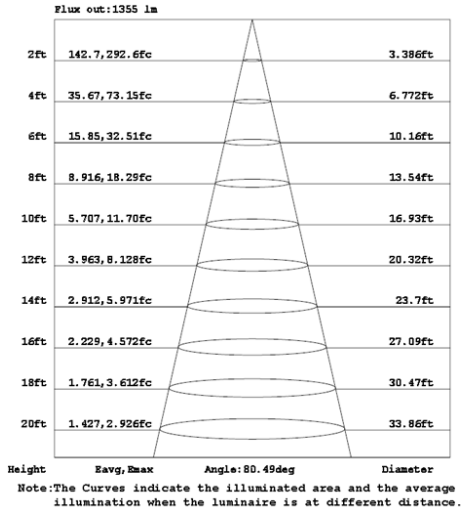
Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	857.9	41.9%
0-40	1313.6	64.1%
0-60	1860.2	90.8%
60-90	189.1	9.2%
70-100	76.5	3.7%
90-120	0.0	0.0%
0-90	2049.3	100.0%
90-180	0.0	0.0%
0-180	2049.3	100.0%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	110.0	5.4%	90-100	0.0	0.0%
10-20	308.4	15.0%	100-110	0.0	0.0%
20-30	439.5	21.4%	110-120	0.0	0.0%
30-40	455.7	22.2%	120-130	0.0	0.0%
40-50	346.7	16.9%	130-140	0.0	0.0%
50-60	200.0	9.8%	140-150	0.0	0.0%
60-70	112.6	5.5%	150-160	0.0	0.0%
70-80	60.5	3.0%	160-170	0.0	0.0%
80-90	16.0	0.8%	170-180	0.0	0.0%

Photometric Data







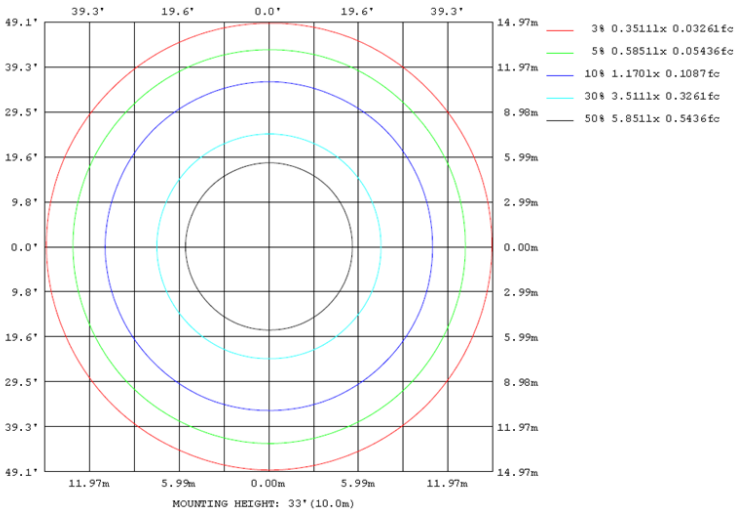


Table--1 UNIT: cd

γ (DEG) \ C(DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5
0	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170
5	1162	1162	1161	1161	1160	1160	1159	1160	1161	1161	1161	1161	1162	1162	1163	1162
10	1137	1137	1135	1135	1133	1133	1132	1133	1134	1134	1135	1136	1138	1137	1139	1138
15	1098	1100	1097	1097	1094	1094	1092	1092	1095	1095	1097	1096	1100	1099	1103	1100
20	1040	1042	1039	1039	1034	1033	1030	1032	1036	1035	1038	1038	1042	1042	1045	1043
25	961	963	960	959	953	953	949	952	956	956	959	959	964	964	968	966
30	860	862	858	858	851	851	847	851	857	854	858	857	864	864	869	865
35	735	738	732	734	726	727	723	727	733	731	736	734	741	740	745	741
40	594	597	589	591	585	588	582	586	590	588	594	594	601	598	602	599
45	449	453	447	447	443	447	441	443	448	445	451	451	457	452	458	455
50	321	318	319	316	317	314	315	312	315	318	317	322	321	324	323	325
55	220	219	220	218	218	215	216	215	218	219	218	219	220	224	223	224
60	152	153	152	153	150	150	149	150	153	151	151	150	153	153	156	154
65	113	114	113	113	111	112	111	111	112	111	112	111	113	113	115	114
70	82.4	83.2	82.1	82.6	81.1	81.3	80.0	80.6	81.4	80.7	81.5	81.2	82.6	82.6	83.9	83.4
75	57.8	58.4	57.5	57.9	56.6	56.8	55.5	55.9	56.5	55.9	56.7	56.5	57.7	57.7	58.8	58.5
80	34.9	35.4	34.6	34.8	33.5	33.6	32.5	32.7	33.2	32.7	33.5	33.3	34.5	34.5	35.6	35.3
85	14.7	15.1	14.5	14.5	13.5	13.4	12.4	12.6	13.0	12.6	13.3	13.3	14.2	14.4	15.3	15.2
90	0.50	0.47	0.48	0.45	0.47	0.46	0.47	0.47	0.44	0.44	0.44	0.44	0.43	0.45	0.46	0.50

2.1.2 Electrical, Photometric and Chromaticity Measurements

Test date	2024-07-10	**Test Ambient:**	25.1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	CRX4	3000K	

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
202407020002	120.0	60	0.165	19.80	0.996

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	3001
Duv	-0.0019
Chromaticity (x, y)	x=0.4341 y=0.3983
Chromaticity (u', v')	u'=0.2512 v'=0.5187
Color Rendering Index (CRI)	96.4
R9	78
Rg	101
Rf	93
Rcs,h1%	-4

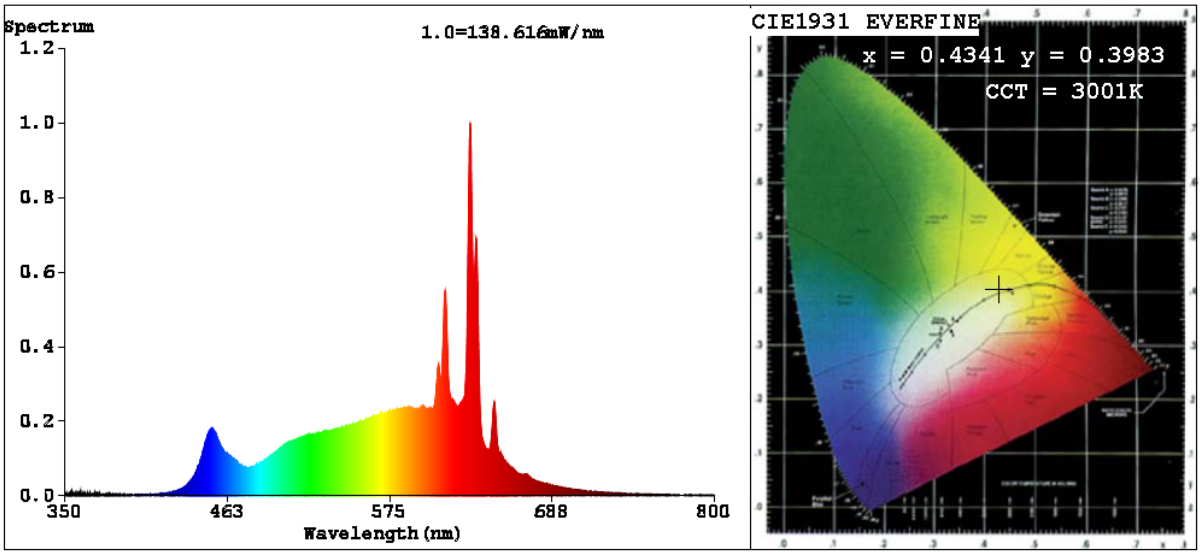
Special Color Rendering Indices			
R1	99	R9	78
R2	99	R10	99
R3	99	R11	95
R4	99	R12	87
R5	99	R13	99
R6	94	R14	98
R7	94	R15	97
R8	90	--	--

Photometric Measurement – Goniophotometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Total Luminous (lm)	2130.8
Luminous Efficacy (lm/W)	107.62

Parameter	Result
Test Voltage (V)	277.0
Frequency (Hz)	60
Total Luminous (lm)	2091.0
Luminous Efficacy (lm/W)	105.55

Spectral Power Distribution & Chromaticity Diagram



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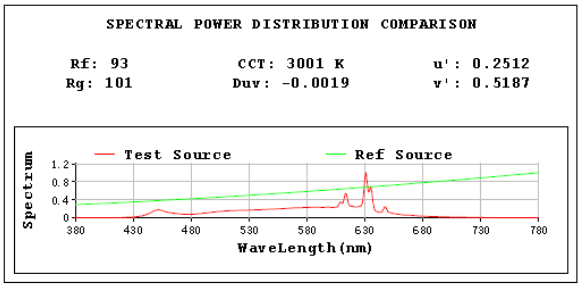
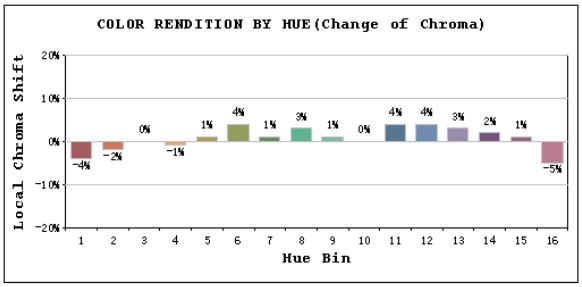
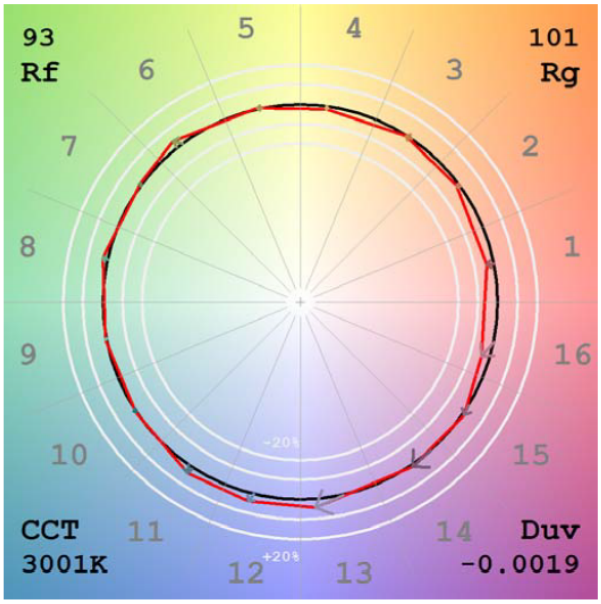
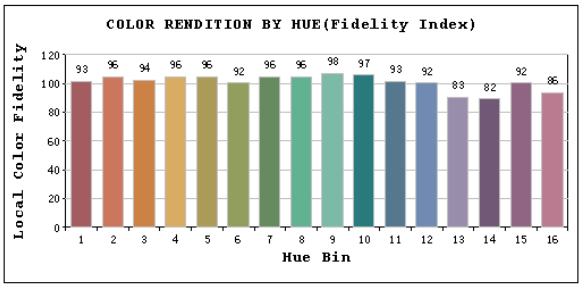
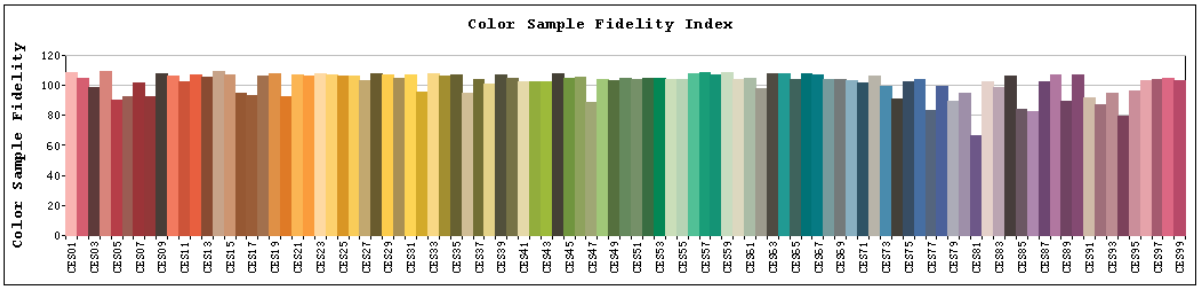

SPECTRAL POWER DISTRIBUTION COMPARISON
Rf: 93
Rg: 101
CCT: 3001 K
Duv: -0.0019
u': 0.2512
v': 0.5187
Test Source
Ref Source
Spectrum
WaveLength(nm)


COLOR RENDITION BY HUE(Change of Chroma)
Local Chroma Shift
Hue Bin


93
Rf
101
Rg
CCT
3001K
Duv
-0.0019


Local Hue Shift
Local Hue Shift
Hue Bin


COLOR RENDITION BY HUE(Fidelity Index)
Local Color Fidelity
Hue Bin


Color Sample Fidelity Index
Color Sample Fidelity

2.1.3 Electrical, Photometric and Chromaticity Measurements

Test date	2024-07-10	**Test Ambient:**	25.1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	CRX4	3500K	

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
202407020002	120.0	60	0.163	19.50	0.996

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	3424
Duv	-0.0023
Chromaticity (x, y)	x=0.4071 y=0.3864
Chromaticity (u', v')	u'=0.2387 v'=0.5097
Color Rendering Index (CRI)	96.9
R9	86
Rg	102
Rf	93
Rcs,h1%	-3

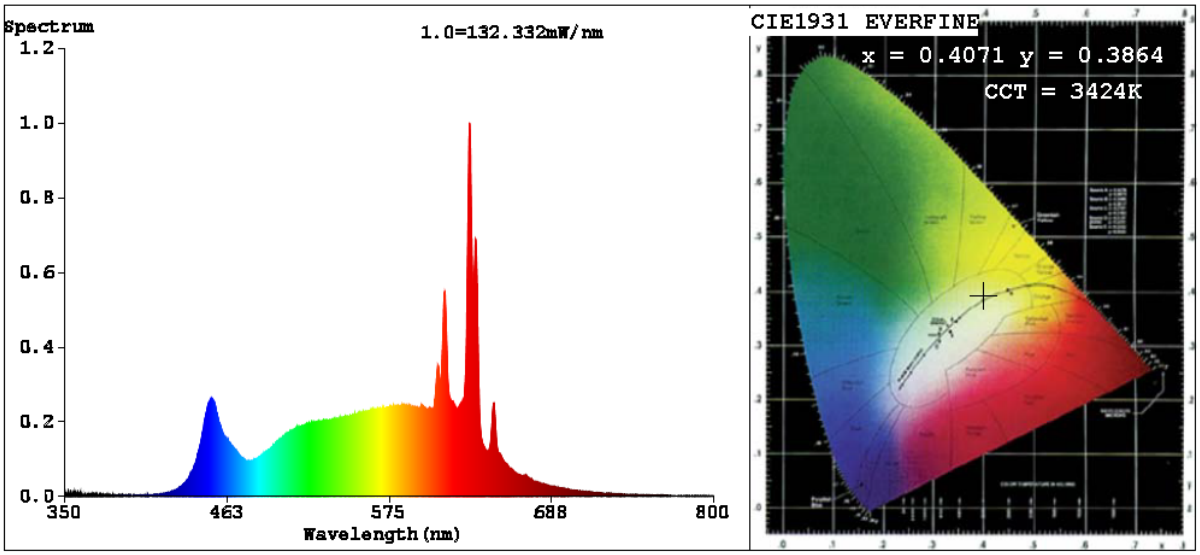
Special Color Rendering Indices			
R1	98	R9	86
R2	99	R10	99
R3	97	R11	94
R4	98	R12	83
R5	98	R13	98
R6	95	R14	97
R7	96	R15	99
R8	95	--	--

Photometric Measurement – Goniophotometer Method:

Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Total Luminous (lm)	2206.2
Luminous Efficacy (lm/W)	113.14

Parameter	Result
Test Voltage (V)	277.0
Frequency (Hz)	60
Total Luminous (lm)	2167.0
Luminous Efficacy (lm/W)	111.01

Spectral Power Distribution & Chromaticity Diagram



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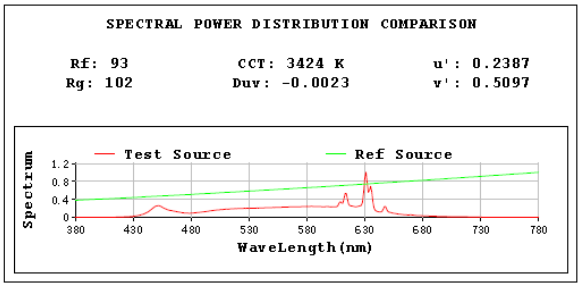
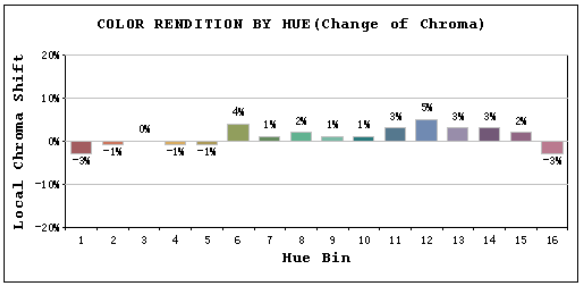
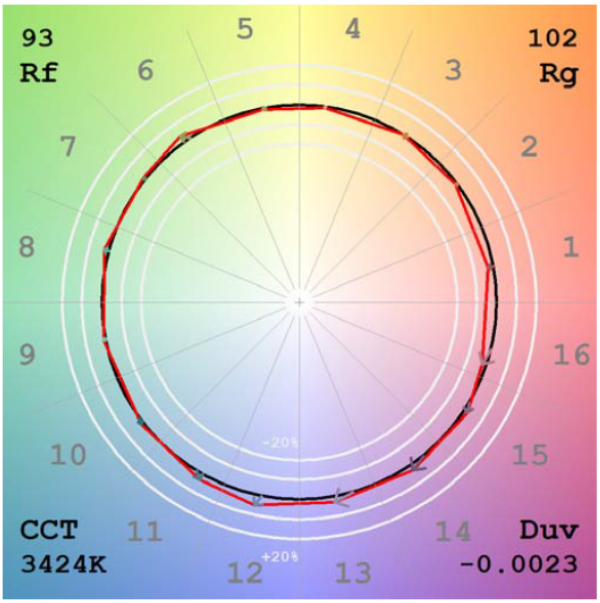
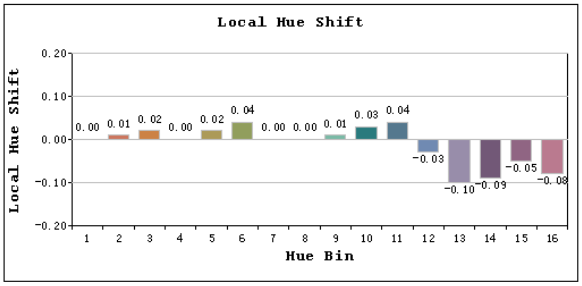
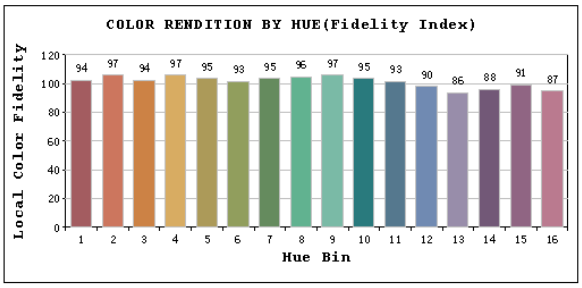
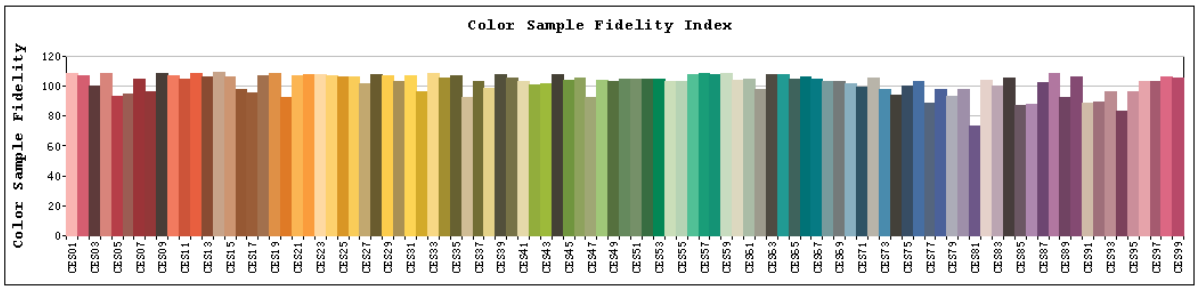

SPECTRAL POWER DISTRIBUTION COMPARISON
Rf: 93
CCT: 3424 K
u': 0.2387
Rg: 102
Duv: -0.0023
v': 0.5097
Test Source
Ref Source
Spectrum
WaveLength(nm)


COLOR RENDITION BY HUE(Change of Chroma)
Local Chroma Shift
Hue Bin


93
Rf
102
Rg
CCT
3424K
Duv
-0.0023


Local Hue Shift
Local Hue Shift
Hue Bin


COLOR RENDITION BY HUE(Fidelity Index)
Local Color Fidelity
Hue Bin


Color Sample Fidelity Index
Color Sample Fidelity

2.1.4 Electrical, Photometric and Chromaticity Measurements

Test date	2024-07-10	**Test Ambient:**	25.1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	CRX4	4000K	

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
202407020002	120.0	60	0.163	19.50	0.996

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	3927
Duv	-0.0009
Chromaticity (x, y)	x=0.3830 y=0.3763
Chromaticity (u', v')	u'=0.2270 v'=0.5018
Color Rendering Index (CRI)	97.5
R9	89
Rg	101
Rf	94
Rcs,h1%	-3

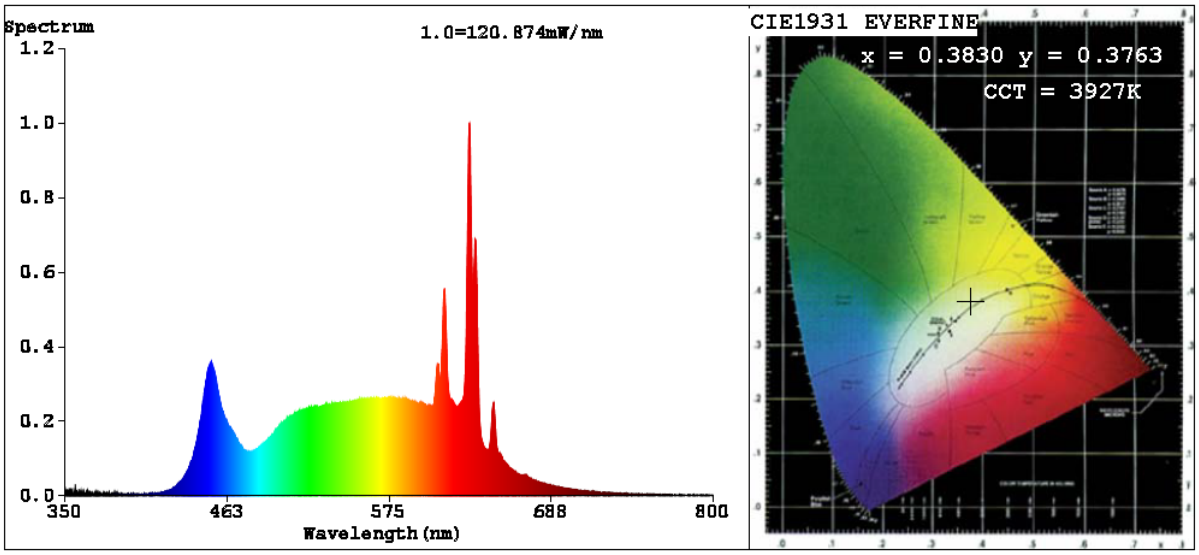
Special Color Rendering Indices			
R1	98	R9	89
R2	99	R10	96
R3	95	R11	95
R4	98	R12	79
R5	99	R13	99
R6	96	R14	96
R7	98	R15	98
R8	97	--	--

Photometric Measurement – Goniophotometer Method:

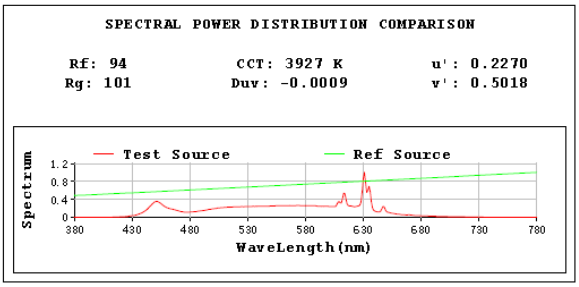
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Total Luminous (lm)	2238.4
Luminous Efficacy (lm/W)	114.79

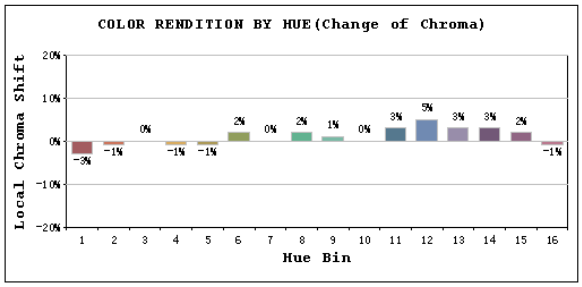
Parameter	Result
Test Voltage (V)	277.0
Frequency (Hz)	60
Total Luminous (lm)	2199.0
Luminous Efficacy (lm/W)	112.65

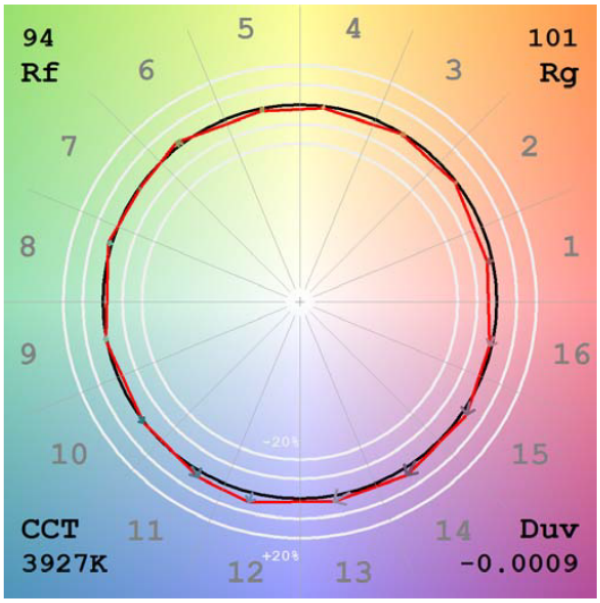
Spectral Power Distribution & Chromaticity Diagram

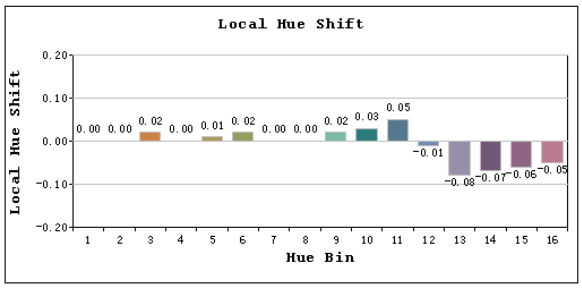


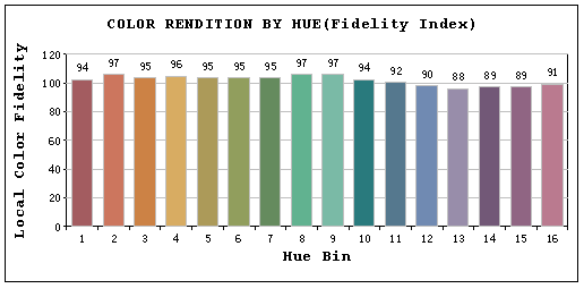
TM30

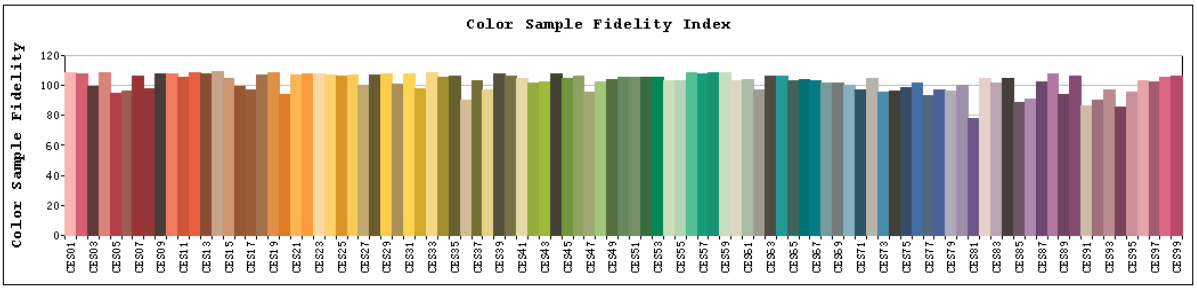

SPECTRAL POWER DISTRIBUTION COMPARISON
Rf: 94
Rg: 101
CCT: 3927 K
Duv: -0.0009
u': 0.2270
v': 0.5018
Test Source
Ref Source
Spectrum
WaveLength(nm)


COLOR RENDITION BY HUE(Change of Chroma)
Local Chroma Shift
Hue Bin


94
Rf
101
Rg
CCT
3927K
Duv
-0.0009


Local Hue Shift
Local Hue Shift
Hue Bin


COLOR RENDITION BY HUE(Fidelity Index)
Local Color Fidelity
Hue Bin


Color Sample Fidelity Index
Color Sample Fidelity

2.1.5 Electrical, Photometric and Chromaticity Measurements

Test date	2024-07-10	**Test Ambient:**	25.1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	90
Model Number	CRX4	5000K	

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
202407020002	120.0	60	0.166	19.80	0.996

Chromaticity Measurement - Sphere-Spectroradiometer Method:

Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	4969
Duv	0.0048
Chromaticity (x, y)	x=0.3469 y=0.3628
Chromaticity (u', v')	u'=0.2084 v'=0.4903
Color Rendering Index (CRI)	94.1
R9	77
Rg	100
Rf	92
Rcs,h1%	-4

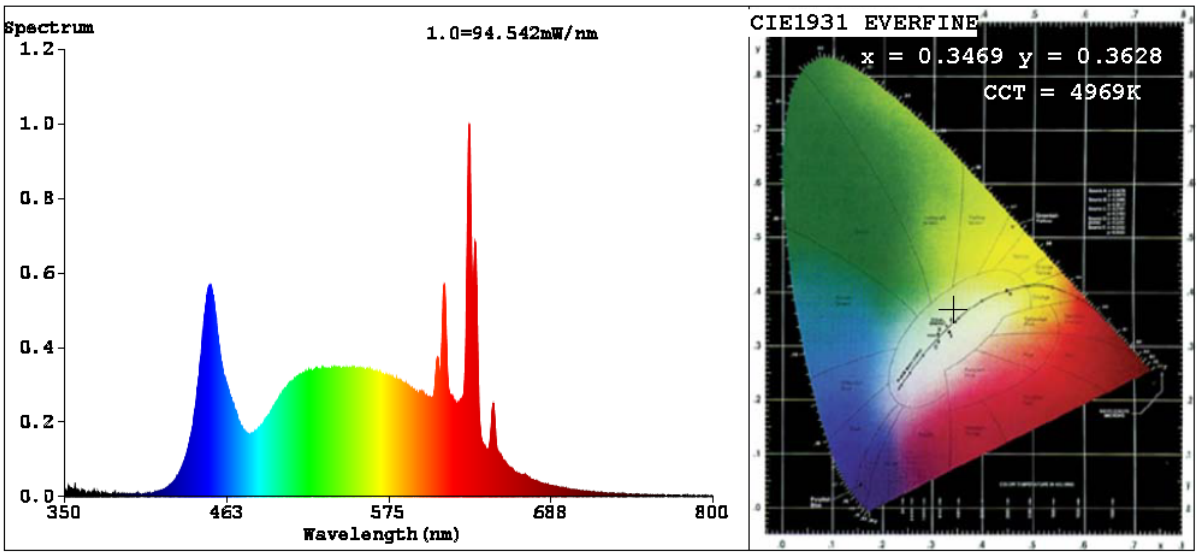
Special Color Rendering Indices			
R1	95	R9	77
R2	94	R10	85
R3	93	R11	94
R4	95	R12	67
R5	93	R13	94
R6	92	R14	96
R7	98	R15	93
R8	93	--	--

Photometric Measurement – Goniophotometer Method:

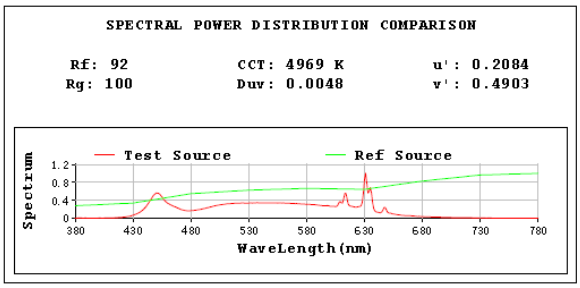
Parameter	Result
Test Voltage (V)	120.0
Frequency (Hz)	60
Total Luminous (lm)	2193.7
Luminous Efficacy (lm/W)	110.80

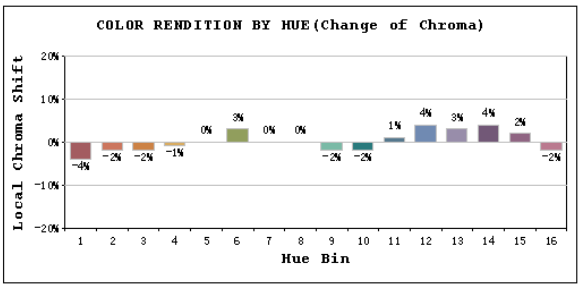
Parameter	Result
Test Voltage (V)	277.0
Frequency (Hz)	60
Total Luminous (lm)	2157.0
Luminous Efficacy (lm/W)	108.88

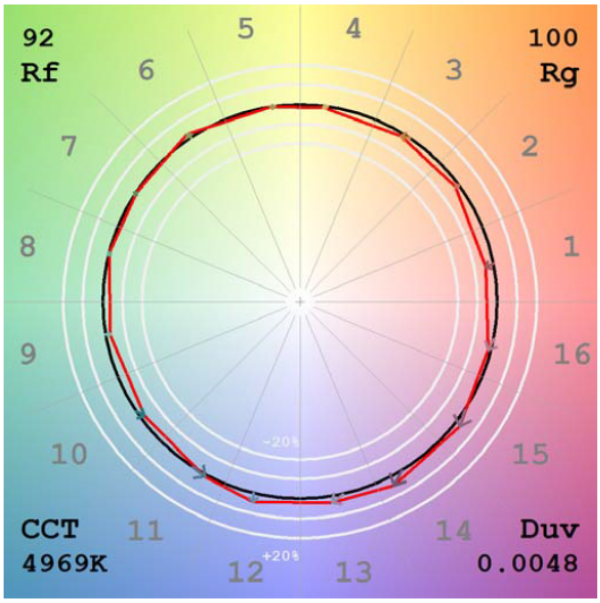
Spectral Power Distribution & Chromaticity Diagram

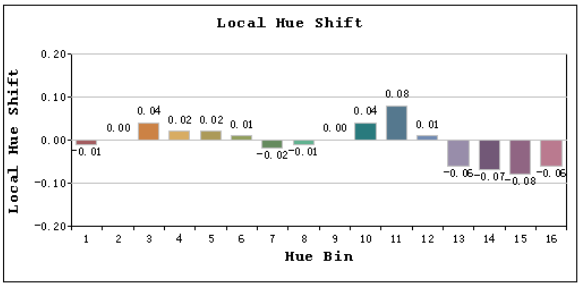


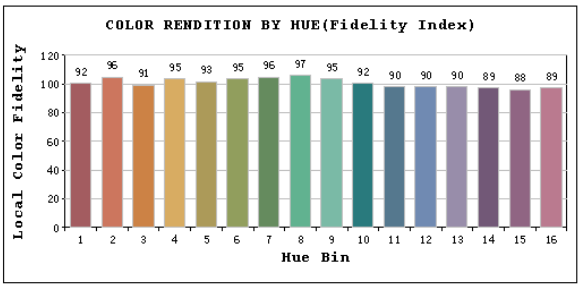
TM30

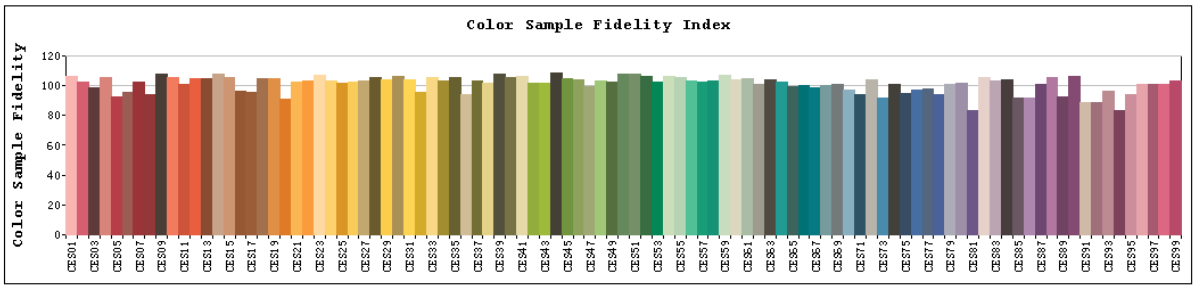

SPECTRAL POWER DISTRIBUTION COMPARISON
Rf: 92
CCT: 4969 K
u': 0.2084
Rg: 100
Duv: 0.0048
v': 0.4903
Test Source
Ref Source
Spectrum
WaveLength(nm)


COLOR RENDITION BY HUE(Change of Chroma)
Local Chroma Shift
Hue Bin


92
Rf
100
Rg
CCT
4969K
Duv
0.0048

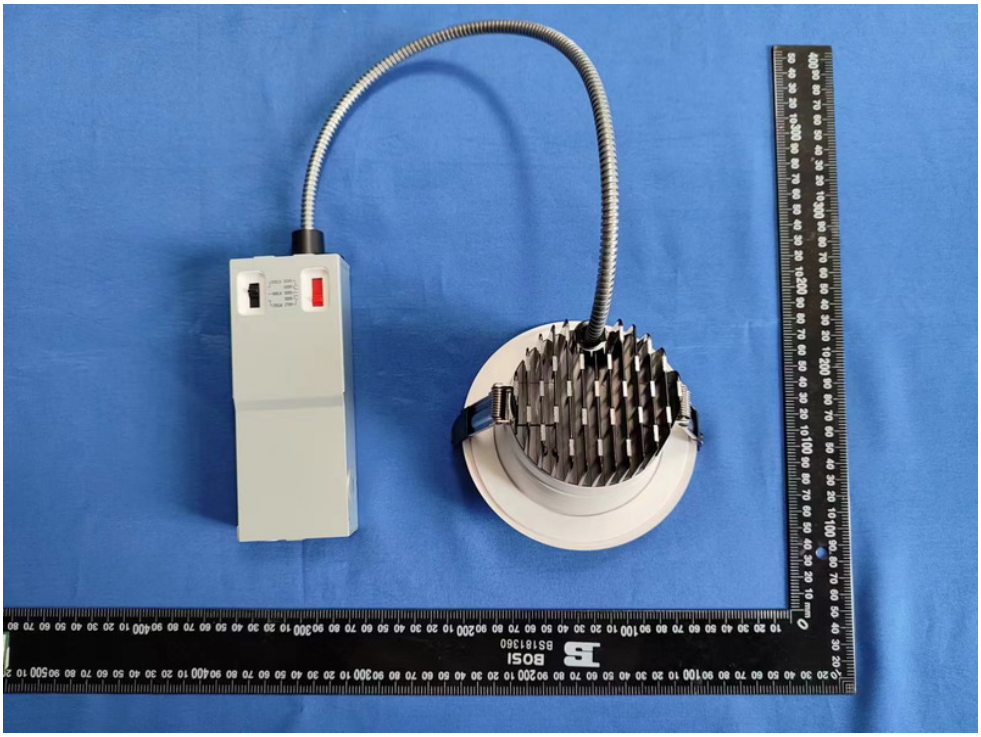

Local Hue Shift
Local Hue Shift
Hue Bin

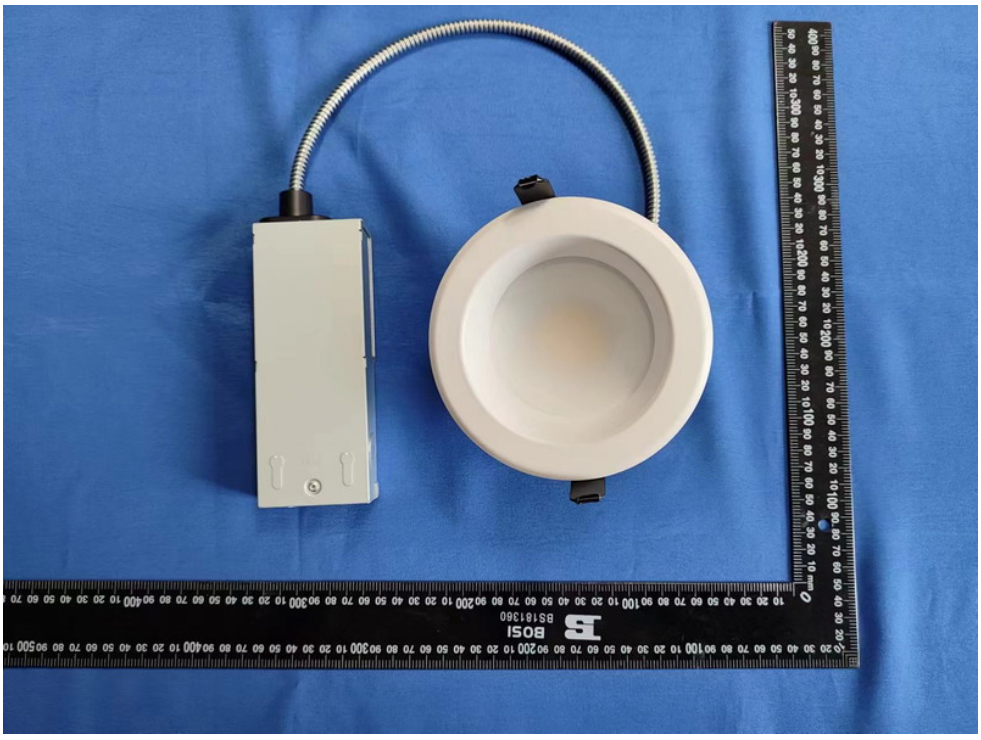

COLOR RENDITION BY HUE(Fidelity Index)
Local Color Fidelity
Hue Bin


Color Sample Fidelity Index
Color Sample Fidelity

Sample No.	Wattage and CCT setting	Test Voltage(V)	Flux(lm)	P(W)	Luminous Efficacy lm/W
CRX4	12W-2700K setting	120	1298.8	11.90	109.14
		277	1295.8	12.63	102.60
	16W-2700K setting	120	1696.9	15.90	106.73
		277	1677.0	16.29	102.95
	20W-2700K setting	120	2049.3	19.80	103.50
		277	2017.0	19.82	101.77
	20W-3000K setting	120	2130.8	19.80	107.62
		277	2091.0	19.81	105.55
	20W-3500K setting	120	2206.2	19.50	113.14
		277	2167.0	19.52	111.01
	20W-4000K setting	120	2238.4	19.50	114.79
		277	2199.0	19.52	112.65
	20W-5000K setting	120	2193.7	19.80	110.80
		277	2157.0	19.81	108.88

3. Product Photo





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