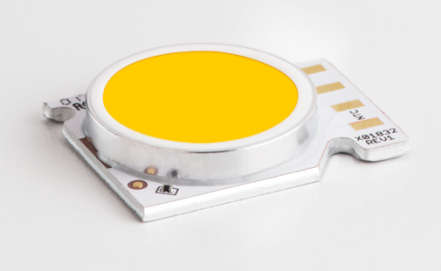
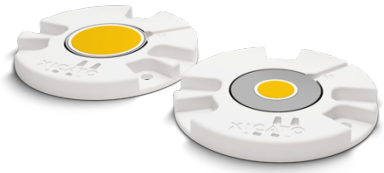
XICATO®

PRELMINARY DATA SHEET

Artist Series® 2200K
with Corrected Cold Phosphor Technology®

XCA, XTM and XIM including XIM Gen4





About Xicato

Xicato designs and develops light sources and electronics that enable architects, designers and building managers to create beautiful, smart spaces in which people love to live and work. With thousands of installations around the globe, Xicato continues to be a leading supplier of high quality lighting solutions. Xicato is defining the future of intelligent light sources by integrating electronics, software and connectivity. Founded in 2007, Xicato's headquarters is based in Silicon Valley and the company has offices in China, Europe and the US.

For further information, visit www.xicato.com.

ABOUT THIS DOCUMENT

This datasheet is just one of many documents and tools available from Xicato to assist lighting designers, specifiers, and luminaire manufacturers in understanding and using Xicato products. These include:

ACCESSORY SELECTION TOOLS (HEATSINKS, OPTICS, DRIVERS)

Xicato has a searchable database of driver, reflectors, and heat sinks that have been evaluated by Xicato and can be integrated with Xicato's light sources. Users can search and filter on a wide range of parameters to match the desired solution for their application. Contact your sales representative or technical application representative for more details.

CAD FILES & DRAWINGS

3D files are available for download on the Xicato website.

APPLICATION & TECHNICAL NOTES

Xicato has an extensive list of application notes for proper handling and usage of the modules.

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GENERAL DESCRIPTION

ARTIST SERIES 2200K

Xicato Artist Series products are designed to provide the most accurate, natural color rendition possible, over the entire visual spectrum. Artist Series continues to set the lighting industry standard when it comes to color quality, initial color consistency, color durability, and lumen maintenance. All Artist Series products deliver CRI Ra > 95 (typical 97-98), CRI R9 > 90 (typical R9 of 95), and extremely high R values across all 15 CIE CRI samples. TM30 metrics are equally strict, with Rf > 90 (typical 95) and Rg ≥ 100 (typical 103). These values outperform not only other LED solutions, but also traditional metal halide or fluorescent lamps. The quality of the Xicato Artist Series makes it the preferred choice of many of the world's top museums, retailers, luxury hotels and residences.

The Artist Series 2200K is a new, special formulation that emulates the lit effect of dimmed incandescent lighting. Artist 2200K is available in 19mm and soon in 9mm LES packages in the Xicato XCA, XTM and XIM platforms. With a maximum output of 2000lm in 19mm and 1300lm in 9mm, Artist 2200K can be under-driven or dimmed to achieve various lumen and efficacy targets.

XCA

The Xicato Core Array (XCA) is the standard LED light source for Xicato Thin Module (XTM) and Xicato Intelligent Module (XIM) platforms, and is also designed for use with the Xicato XSA-401 45mm holder. Available in 19mm and 9mm Light Emitting Surface (LES) and many CRI, CCT, and lumen output options, XCA provides unique benefits due to the Xicato patented Corrected Cold Phosphor Technology® process, which features:

- Remote phosphor with separate thermal paths for the phosphor and the underlying LED array
- Dual phosphor coats – an initial coat is applied on the inner surface of the sapphire window, the unit is tested, and a second coat is applied to the outer surface to precisely target CCT and CRI values

It is the XCA with Corrected Cold Phosphor Technology that allows Xicato to be the only manufacturer to provide a long-term warranty on both lumen maintenance and color consistency, for lowest total cost of ownership and smallest ecological footprint. With Xicato's industry leading color quality, consistency and application-optimized light spectra, XCA provides simply the most beautiful lit effect, and our warranty insures that consistent lighting design quality is maintained from build to refurbish.

XTM

The Xicato Thin Module (XTM) consists of a Xicato Core Array (XCA), pressure fit into a compact yet robust holder designed to allow attachment of a large ecosystem of lenses and heatsinks to facilitate design and construction of a wide variety of downlight and spot fixtures. The XTM includes:

- LED emitting core
- Zhaga-compatible holder
- Fixed wires

The integration of core and holder, with full UL and CE approval, provides the assurance of quality, and simplifies the certification of customer luminaires. XTM can accommodate Xicato's entire portfolio of color, CCT, and output options.

XIM

The Xicato Intelligent Module (XIM) is a compact, integrated LED lighting module designed to fit a wide variety of downlight and spot fixtures, and to simplify the design and assembly of controllable LED luminaires. The XIM includes:

- LED emitting core
- Drive electronics – constant voltage to constant current (dimmable)
- Microprocessor with firmware and static random access memory (SRAM)
- Internal sensors that detect intensity, LED and PCB temperature, power, and other operating parameters
- Bluetooth Smart wireless transceiver (XIM Gen4 only)

The extremely high quality, integrated XIM driver dims more smoothly and deeply than high-end standalone LED drivers. Combined with Xicato's industry leading color quality, consistency and application-optimized light spectra, XIM provides simply the most beautiful lit effect.

Integration makes the XIM more affordable to implement and enables smaller downlight or spotlight fixtures.

Over its broad dimming range, XIM exceeds the highest international standards for avoiding health effects related to flicker - it is the only LED solution to achieve this.

XIM GENERATION 4 (XIM GEN4)

To the standard XIM, XIM Gen4 adds Bluetooth wireless connectivity and the distributed intelligence required to respond to all types of sensors, switches, and mobile app commands. XIM Gen4 is a control system, a beacon, and an intelligent IoT (Internet of Things) node that fundamentally changes the economics of lighting control, smart spaces and the lighting industry. XIM Gen4 dramatically simplifies and cost reduces the planning, installation, provisioning, control and management of controlled lighting, while enabling new location-based information services.

XIM Gen4 is about more than Lighting. XIM Gen4 can advertise Google Eddystone and/or Apple iBeacons, providing wayfinding and other location-based information about such things as museum exhibits, retail merchandise, or restaurant menus.

XIM Gen4 is part of a total ecosystem with compatible software, motion, lux, temperature, humidity and vibration sensors, switches, and gateways. Built on the ubiquitous Bluetooth standard already in billions of smartphones and tablets, Xicato has opened its software interfaces (APIs) to enable third-party developers to write their own apps, expanding opportunities for OEMs, lighting designers, M&Es, and end users.

XICATO LIGHT SOURCE PORTFOLIO

The Xicato Corrected Cold Phosphor® portfolio is optimized for downlight, track, spot, and other directional lighting applications, but has been used extensively in pendants and decorative fixtures.

The Xicato Linear Tape – Artist Series is perfect for cove, display case, undercabinet, closet, display shelf and other applications where extremely high color quality and consistency are important for presenting jewelry, glassware, ceramic, clothing, food, or fine surfaces such as wood, brick, stone or fabric.

	Lumen Output	2200K		2700K		3000K		3500K		4000K	
Xicato Linear Tape											
XLT Artist Series CIE CRI: Ra 95+, R9 90+	720/m			▬		▬		▬		▬	
Corrected Cold Phosphor® modules											
Artist Series® CIE CRI: Ra 95+, R9 90+ IES TM-30: Rf 96, Rg 103	700			◎		◎		◎		◎	
	1300	◎		◎	◎	◎	◎	◎	◎	◎	◎
	2000		◎	•	◎	•	◎	•	◎	•	◎
	3000				◎		◎		◎		◎
	4000				•		•		•		•
Beauty Series™ CIE CRI: Ra 95 IES TM-30: Rf 91, Rg 107											
	1300				◎						
	2000				◎						
Designer Series™ CIE CRI: Ra 90+, R9 50+ IES TM-30: Rf 88, Rg 101	700			◎		◎		◎		◎	
	1300			◎	◎	◎	◎	◎	◎	◎	◎
	2000			◎	◎	◎	◎	◎	◎	◎	◎
	3000				◎		◎		◎		◎
	4500						•		•		•
Standard Series CIE CRI: Ra 80+ IES TM-30: Rf 78, Rg 101	700			◎		◎		◎		◎	
	1300			◎	◎	◎	◎	◎	◎	◎	◎
	2000			◎	◎	◎	◎	◎	◎	◎	◎
	3000				◎		◎		◎		◎
	4000				•		•		•		•
	5000				•		•		•		•
Vibrant Series® V80 CIE CRI: Ra 80+ IES TM-30: Rf 73, Rg 105	700					◎					
	1300					◎	◎				
	2000					◎	◎				
	3000						◎				
	4000						•				
	5000						•				
Vibrant Series® V95 CIE CRI: Ra 95+ IES TM-30: Rf 93, Rg 106	700					◎					
	1300					◎	◎				
	2000					•	◎				
	3000						•				
	4000						•				

Tape ▬

LEGEND	XCA+XTM	+XIM
9mm LES	•	◎
19mm LES	•	◎

Note:
CRI listed as XX+ are guaranteed minimum values. Typical values are min+3.

ORDERING GUIDE

PART NUMBERING SYSTEM

NOTE that not all combinations are currently available. Please see listing, below.

X	IM	19	95	30	13	A2	A
Xicato	CA = Core Array IM = Intelligent Module TM = Thin Module	Light Emitting Surface (LES mm) 09 = 9 19 = 19	Series 80 = Standard 95 = Artist BT = Beauty V8 = Vibrant 80 V9 = Vibrant 95	CCT (K) 27 = 2700 30 = 3000 35 = 3500 40 = 4000 01 = NA	Flux (nominal) 07 = 700 13 = 1300 20 = 2000 30 = 3000 40 = 4000 50 = 5000	Feature Group A2 = DALI A3 = 1-10V CC = constant current	Revision

PART CODES AND DESCRIPTIONS

ARTIST SERIES 2200K

Part Number	Description
XCA Core Arrays	
XCA09952213CCA	LED Core Array, XCA, LES09, Artist, 2200K, 1300LM
XCA19952220CCA	LED Core Array, XCA, LES19, Artist, 2200K, 2200LM
XIM Modules	
XIM09952213A2A	LED Module, XIM, LES09, Artist, 2200K, 1300LM, DALI
XIM09952213A3A	LED Module, XIM, LES09, Artist, 2200K, 1300LM, 1-10V
XIM09952213A5A	LED Module, XIM, LES09, Artist, 2200K, 1300LM, DALI+BLE
XIM09952213A6A	LED Module, XIM, LES09, Artist, 2200K, 1300LM, 1-10V+BLE
XIM19952220A2A	LED Module, XIM, LES19, Artist, 2200K, 2000LM, DALI
XIM19952220A3A	LED Module, XIM, LES19, Artist, 2200K, 2000LM, 1-10V
XIM19952220A5A	LED Module, XIM, LES19, Artist, 2200K, 2000LM, DALI+BLE
XIM19952220A6A	LED Module, XIM, LES19, Artist, 2200K, 2000LM, 1-10V+BLE
XTM Modules	
XTM09952213CCA	LED Module, XTM, LES09, Artist, 2200K, 1300LM
XTM19952220CCA	LED Module, XTM, LES19, Artist, 2200K, 2000LM

Suggested XIM Cable Harness (one per unit, order separately)

XSA-331

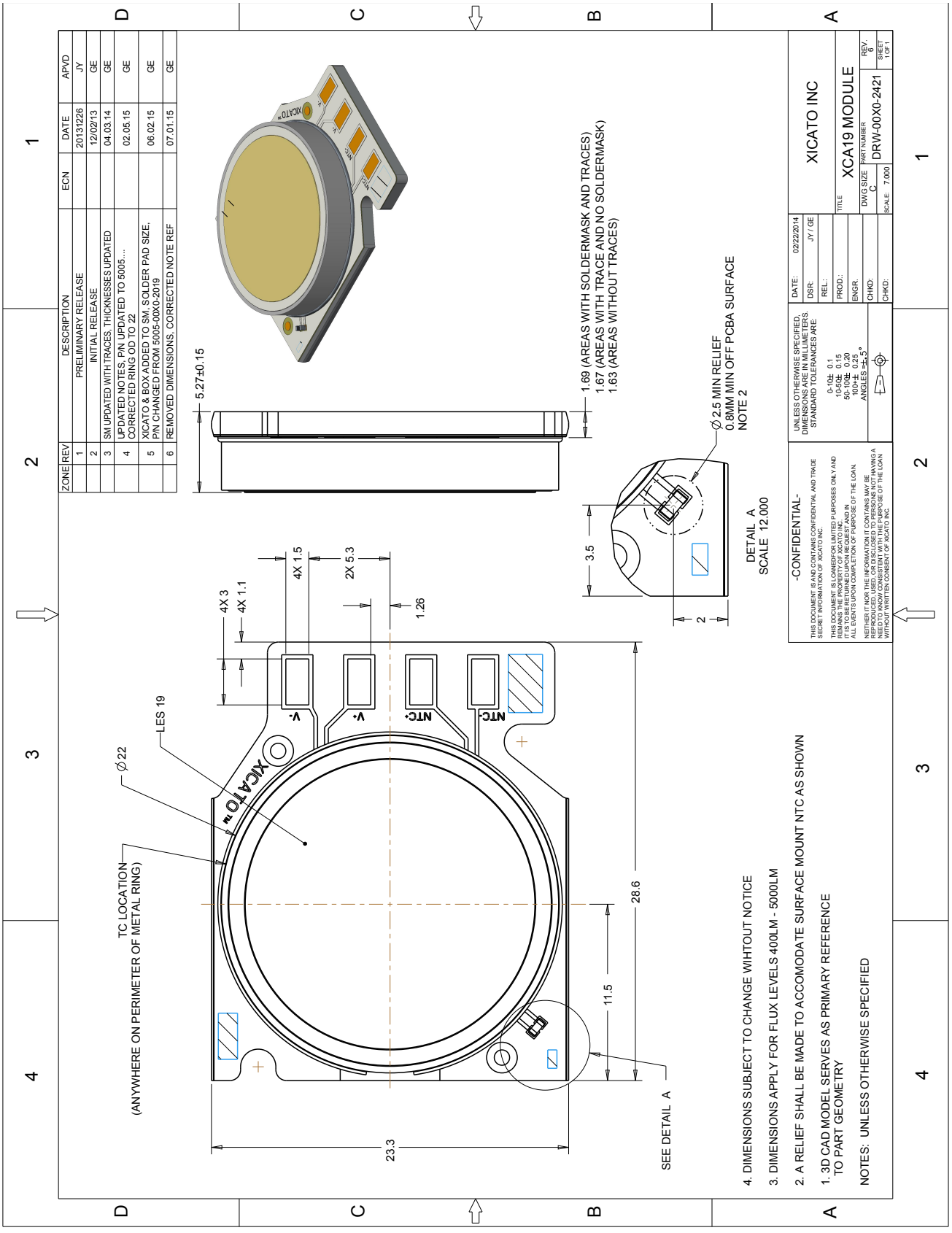
XIM 6-pin 600mm 1-10V/DALI Wire Harness

MECHANICAL SPECIFICATIONS

Dimensions:	28.6mm x 23.3mm (1.126” x 0.917”)
Weight:	6 grams (0.21 oz.)
Light Emitting Surface options:	Ø 9mm (0.35”) Ø 19mm (0.75”)
Module Source Type:	Corrected Cold Phosphor Technology®
Interfaces – Electrical:	Gold plated contacts for solder or spring contact connection.
Interfaces – Mechanical:	Thermal adhesive or clamp mechanism (holder) required for attachment. Screws or fasteners directly to XCA not permitted. Metal ring surrounding LES shall not be mechanically stressed or used as an alignment feature. XCA shall not be potted or otherwise encapsulated… optical cavity must maintain air ventilation. Electrical contacts may be selectively coated for electrical isolation, but coating shall not come into contact with LES or metal ring surrounding LES.
Interface – Thermal:	Integrated thermal pad. Recommend a mating thermal interface (i.e. heatsink) surface flatness of ≤ 0.1mm in order to maintain thermal performance. Xicato recommends that the heatsink have no center hole, as heatsink center hole and hole diameter affects thermal performance and max power – see *Application Note – Xicato XCA Assembly Guide* on Xicato website.
Maximum Case Temperature:	90°C
Shipping (100 count box):	45mm x 35mm x 5mm (18” x 14” x 2”) 0.9 kg (2 lbs.)
Storage Temperature:	-40°C to +85°C

MECHANICAL DRAWINGS

See XTM and XIM datasheets for mechanical specifications and drawings of those platforms. XCA in 9mm is identical except for the diameter of the LES itself.



COLOR METRICS: ARTIST SERIES 2200K

Optimized for precise, accurate, natural color rendering at low correlated color temperature.

Artist Series 2200K is designed to perfectly emulate dimmed incandescent or halogen light sources, with precise color rendering by CIE or IES standards, for the most exacting illumination of art, architecture, people, or other fine materials.

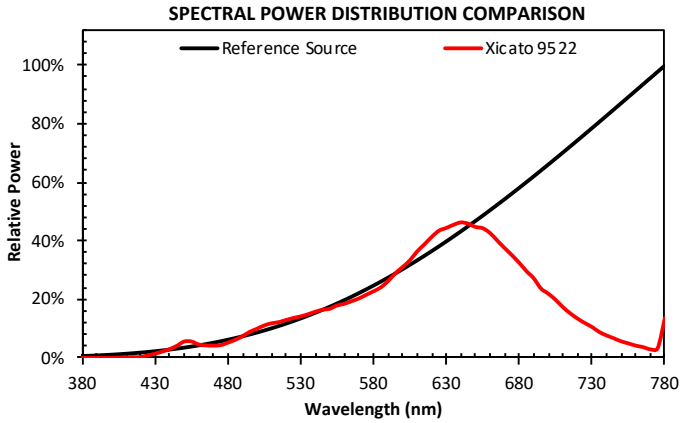
All color rendering data at highest rated drive current and 70°C case temperature (T_c)
Tester consistency (reproducibility) ± 0.0002 Duv (CIE 1964) from NIST reference

Correlated Color Temperature:	2200K, ± 30K
Initial Color Consistency:	≤ 1 x 2 Macadam ellipses (SDCM) at 70°C, B0
CIE CRI Minimums:	R_a ≥ 95, R9 ≥ 90
Color Maintenance:	Consistency maintained < 0.003 Δu'v' at 50,000 hours
Lumen Maintenance:	L70/B0 at 50,000 hours
Warranty:	5 year for individual modules (B0) on mortality, color and lumen maintenance. Details at www.xicato.com/support/warranty

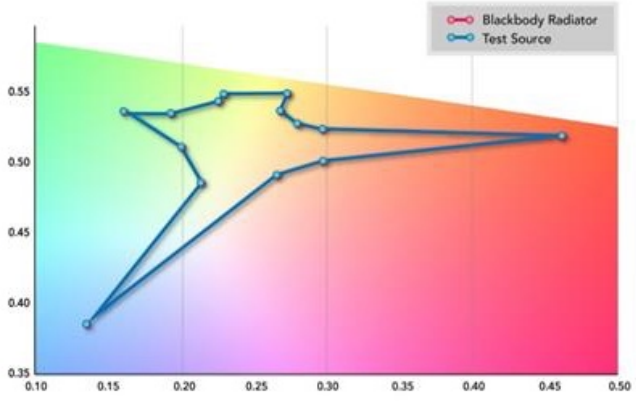
CIE CRI COLOR METRICS (VALUES ARE TYPICAL)

	R_a	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	GAI_{BB}
Artist Series	96	96	97	99	93	94	91	97	97	94	94	87	87	95	98	99	104

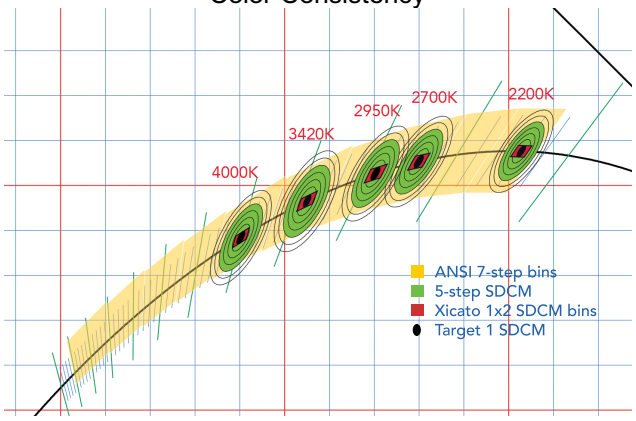
Spectral Power Distribution vs. Reference Source



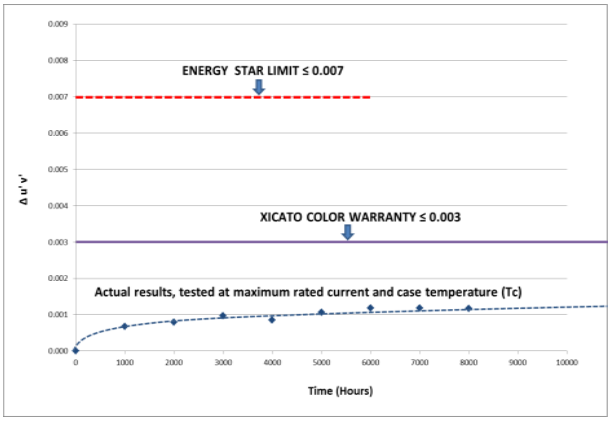
CIE Color Gamut



Color Consistency



Color Maintenance



IES TM-30-15 COLOR METRICS

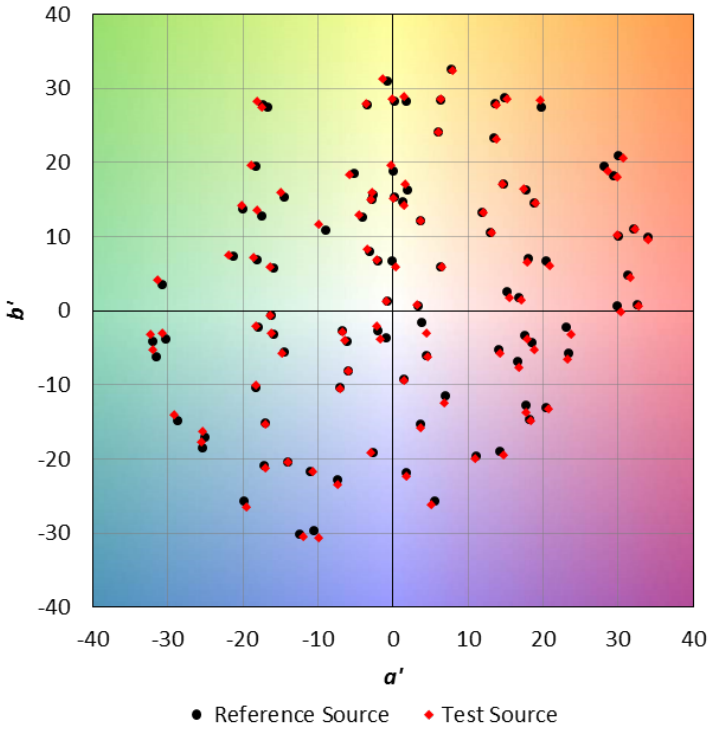
(Values are typical. Based on 3000K CCT)

IES TM-30 Color Fidelity (R_f) 95

IES TM-30 Color Gamut (R_g) 101

CES CHROMATICITY COMPARISON

This plot shows the shift in chromaticity for each individual color evaluation sample (CES). Closer proximity between paired dots indicates higher fidelity.

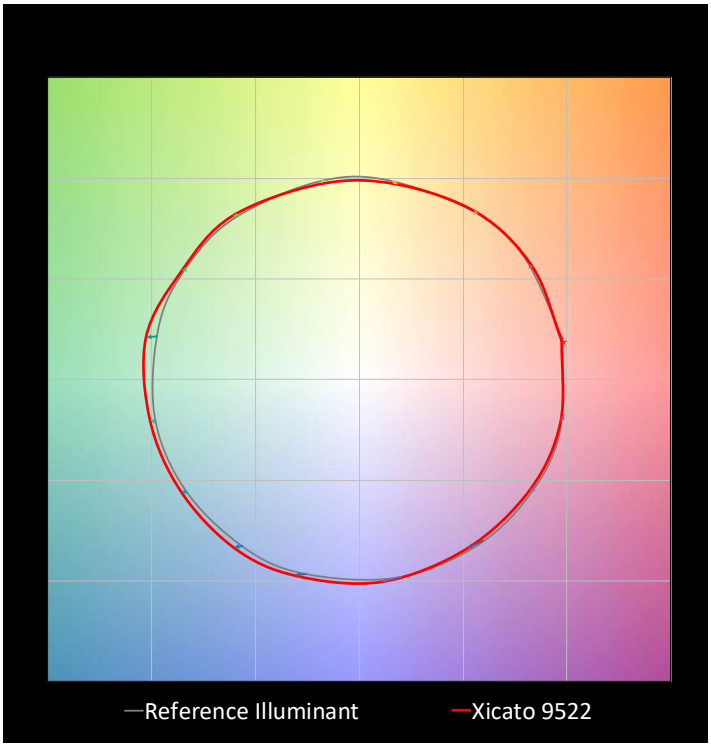


COLOR VECTOR GRAPHIC

This plot shows the average chromaticity shift for the samples within each of 16 hue bins, which are compiled out of the 99 IES TM-30 Color Evaluation Samples. The values are normalized so that the reference (in black) is a circle.

Vector arrows indicate the direction and degree of the shift for each hue bin.

- Radial shift indicates an increase/decrease in saturation.
- Tangential shift indicates a shift in hue.
- Length of arrow indicates degree of shift.

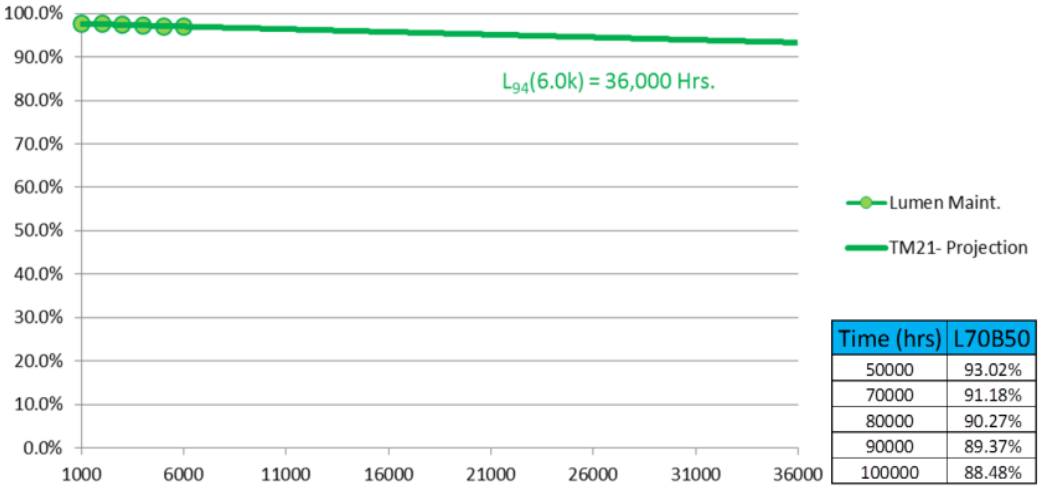


IES LM-80

ARTIST SERIES® 19MM LES, 2700K, 2000LM

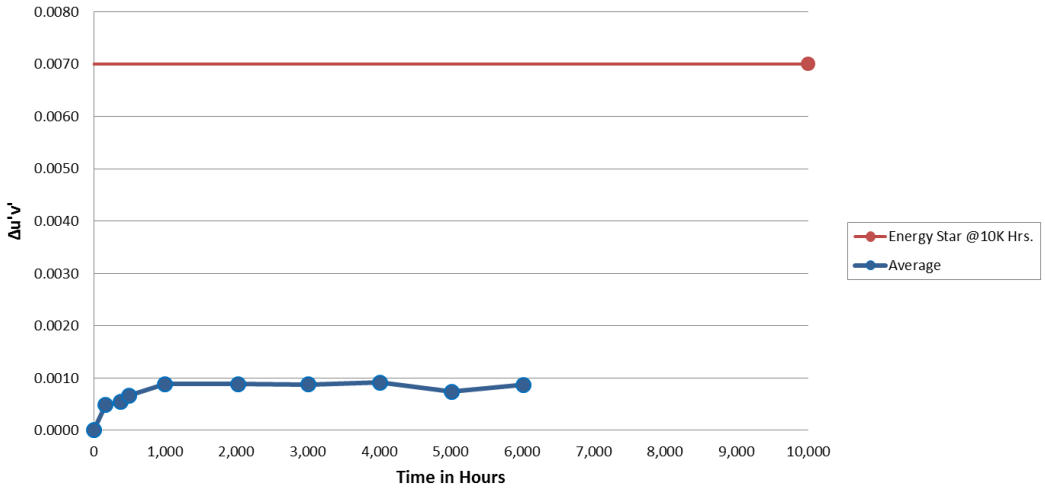
Testing conducted at T_c = 90°C, I_f = 1050mA, HTOL, 6000 Hrs.

LUMEN MAINTENANCE

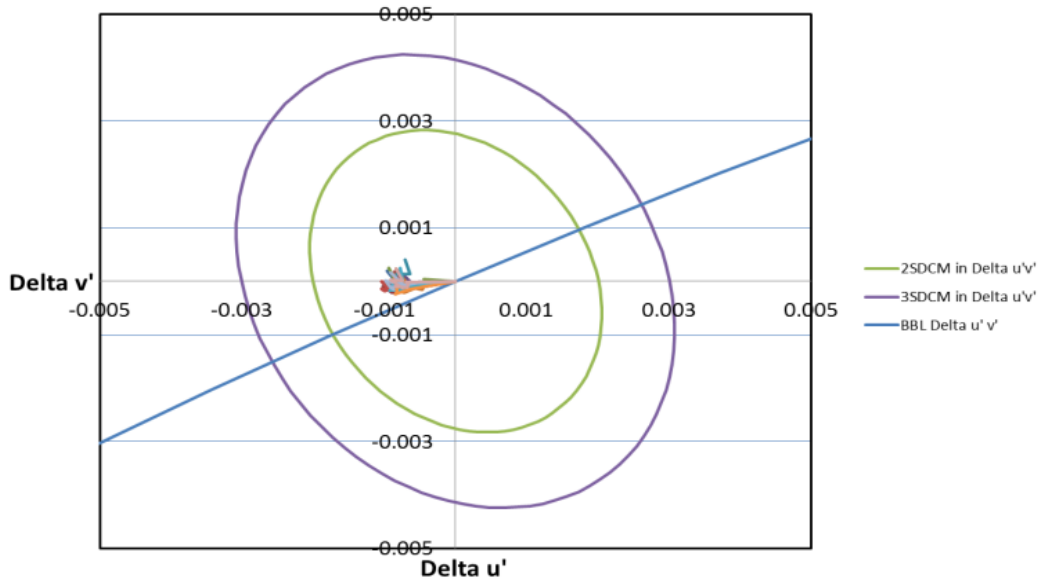


Time (hrs)	L70B50
50000	93.02%
70000	91.18%
80000	90.27%
90000	89.37%
100000	88.48%

COLOR MAINTENANCE



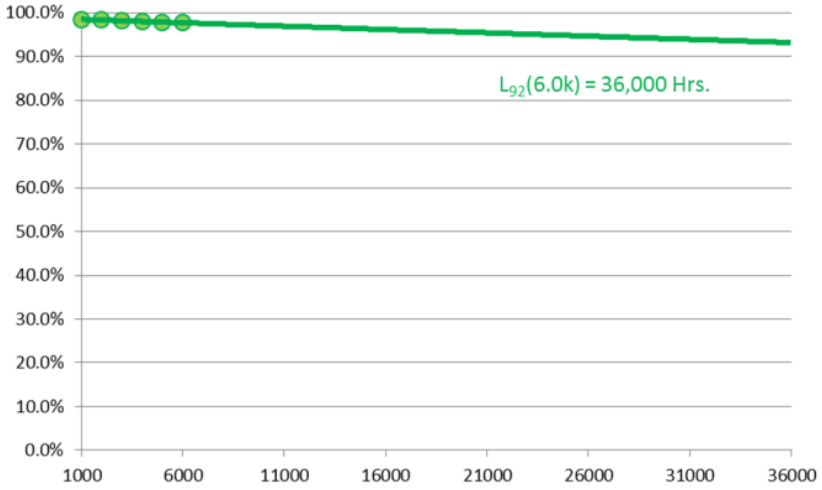
COLOR MAINTENANCE (NORMALIZED)



ARTIST SERIES® 19MM LES, 3000K, 3000LM

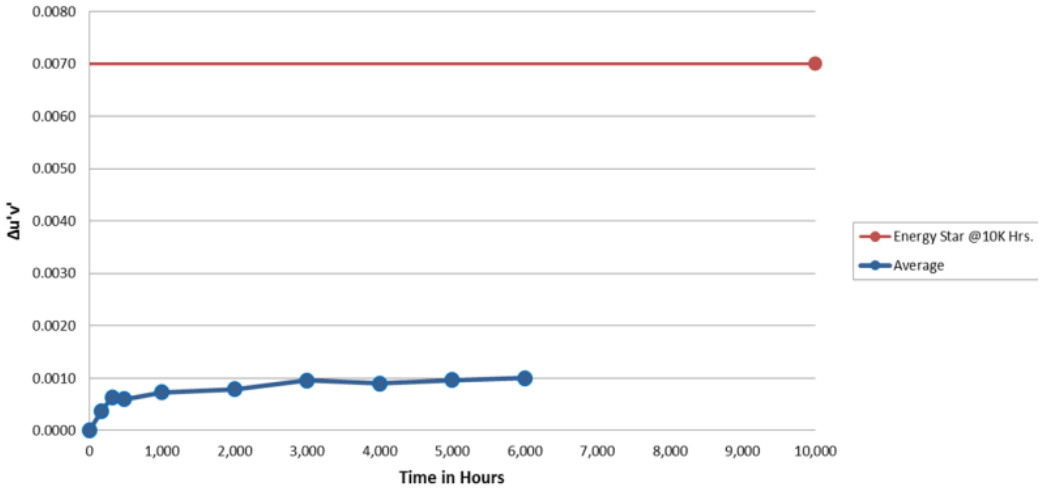
Testing conducted at T_c = 90°C, I_f = 1050mA, HTOL, 6000 Hrs.

LUMEN MAINTENANCE

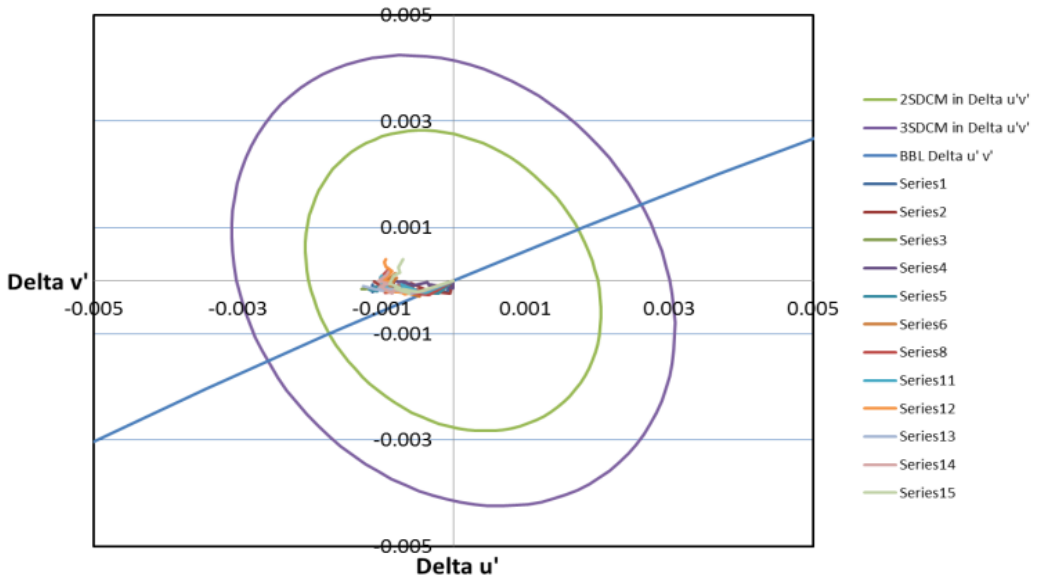


Time (hrs)	L70B50
50000	89.24%
70000	85.74%
80000	84.04%
90000	82.37%
100000	80.74%

COLOR MAINTENANCE



COLOR MAINTENANCE (NORMALIZED)



PERFORMANCE CHARACTERISTICS

More extensive performance data is available from your Xicato sales representative.

NOTES:

1. Data shown in the tables below are taken at a recommended operating test point (Tc) temperature of 70°C.
2. Voltage data is based on 20°C to 90°C operating range. For operation outside this range, contact Xicato.
3. Module is designed for use with a constant current power supply with maximum output current, including tolerance, of up to 770mA (700mA), 1100mA (1050mA), and 1500mA (1400mA).
4. Voltage data based on 20°C to 90°C operating range. For operation outside this range, contact Xicato.
5. Minimum, Maximum, and Typical power consumption can be calculated from the ranges provided.
6. Absolute range of lumen output is ±10% of typical value
7. Maximum peak ripple current with frequencies ≥ 100Hz for each product are 1400mA (700 lm), 2000mA (1300 lm) and 2800mA (2000 lm).
8. CCT data ANSI/NEMA compliant.
9. Specifications are subject to change without notice.

INITIAL COLOR CONSISTENCY

Correlated Color Temp		Initial Color Consistency		
Nominal	**Actual**	**CCT**	**SDCM**	**Duv**
2200K	2200K	± 30K	≤ 1 x 2	± 0.0008
2700K	2700K	± 40K	≤ 1 x 2	± 0.001
3000K	2950K	± 50K		
3500K	3420K	± 60K		
4000K	4000K	± 70K		

ELECTRICAL AND EFFICACY PERFORMANCE: XCA AND XTM

LES	Rated Lumens	Current	Forward Voltage			Power	Flux	Efficacy
		mA	Min	Typ	Max	(W)	Lm	Lm/W
9mm	1300	1050					1300	
		700						
		500						
		350						
19mm	2000	1050	19.8	24.4	27.0	25.7	2000	78
		700	19.1	23.6	26.2	16.5	1400	85
		500	18.7	23.1	25.7	11.6	1057	92
		350	18.3	22.8	25.3	8.0	797	100

ELECTRICAL AND EFFICACY PERFORMANCE: XIM

Note that XIM efficacy metrics include losses in the DC-to-constant current control and communications (e.g. Bluetooth) circuitry.

Dim level		100%	75%	50%	25%	10%	5%	1%	0%
XIM19952220A5A	DC input (W)	29.8	21.1	13.5	6.7	2.9	1.6	0.53	0.27
	Efficacy (lm/W)	67	71	74	74	70	64	37	NA
XIM19952220A6A	DC input (W)	29.9	21.2	13.6	6.9	3.0	1.7	0.64	0.38
	Efficacy (lm/W)	67	71	74	73	67	60	31	NA

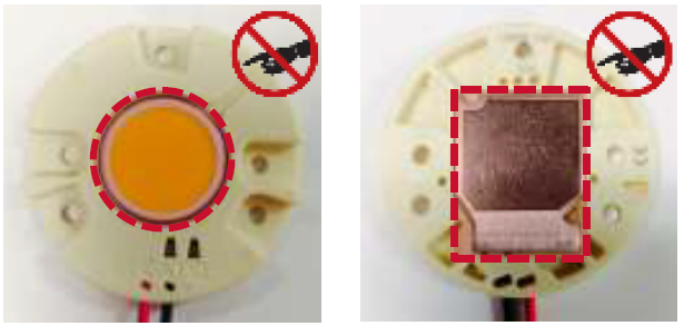
BASIC HANDLING AND ASSEMBLY

GENERAL HANDLING

Make sure your **hands and tools are clean** before handling module.

Do not drop module or allow modules to rattle in a loosely packed container. This may loosen the LED array from its protective holder, or scratch the phosphor or thermal interface pad.

Do not touch the phosphor coating on top of the LED array (the light emitting surface) **or the integrated thermal pad** underneath. These surfaces are sensitive to scratches, contamination, and debris which may decrease module performance. If any dust or debris accumulates on either surface, clean the surface by blowing on it with clean air. The phosphor surface can also be cleaned by gently wiping with isopropyl alcohol.



Do not touch sensitive surfaces. Keep them clean.

Take special care not to press down on the phosphor surface of the array. Pressure to this area may cause the array to dislodge itself from its protective plastic housing.

ASSEMBLY

Always use recommended screws and fasteners, and apply recommended torque. Take caution not to exceed these values as this may damage the module. Xicato recommends using a spring lock washer with either a flat washer or adapter ring at all mounting locations to reduce the likelihood that the fasteners will loosen under shock, vibration, or thermal cycling.

Be sure not to reverse polarity on the electrical leads to the module, as this will damage the LED array. Be absolutely certain to use the proper wire gauge and color and, when required, poke them into the proper connector. One-time poke-in connectors are not guaranteed to function properly if wires are pulled loose and reinserted.

Make sure that surfaces of thermal interface pad and heat sink are clean and free of debris before assembly. Visually verify that there are no gaps between thermal surfaces, and that pressure has been evenly applied across the entire surface.

Please note that Xicato is the only authorized distributor and supplier of twist-lock adaptor rings. For more information on adapter ring options, contact your XICATO account manager or technical representative.

For more detailed handling and assembly instructions, including:

- How to properly reinsert an LED array into its holder
- How to mount reflectors, adapters, fasteners
- How to mount unit to heat sinks
- How to mount spacers
- How to test the module for thermal performance

…and more, please see *Application Note – Xicato XCA Assembly Guide* on the Xicato website.

REGULATORY INFORMATION

DRIVE CURRENT

The product is designed for use with a constant current power supply. Refer to the Technical Data table for details on current and forward voltage limitations.

ELECTRICAL SAFETY & HANDLING

CE:	IEC 62031:2008, Class III
UL:	8750 recognized Class 2. Suitable for dry and damp locations.
Ingress Protection rating:	IP-20
CSA:	C22.2 No. 250.13-12.

ESD Class 3B (HBM). No special ESD handling procedures required.

EYE SAFETY

The product is tested in accordance with IEC 62471 and is rated as exempt for Actinic UV, and Near UV.
For Blue Light it is rated for Risk Group 1.

CHEMICAL SAFETY

The following chemicals should be avoided, even in small quantities, within the module:

Hydrochloric Acid	MEK (Methyl Ethly Ketone)	Dichloromethane
Sulfuric Acid	MIBK (Methyl Isobutyl Ketone)	Rosin Flux Solder
Nitric Acid	Toluene	Castor Oil
Acetic Acid	Xylene	Lard Oil
Sodium Hydroxide	Benzene	Linseed Oil
Potassium Hydroxide	Gasoline	Petroleum Oil
Ammonia	Mineral Spirits	Silicone Oil
Sulfur (Used in Rubber Processing)	Tetracholoromethane (Carbon tetrachloride – CCl_4)	Halogenated Hydrocarbons (Containing F, Cl, or Br)

ENVIRONMENTAL SAFETY

RoHS compliant

Lead content:	None
Mercury content:	None
UV or IRC Emissions:	None

LUMINAIRE SPECIFICATION: RECOMMENDED LED MODULE

GENERAL DESCRIPTION

Color Point and Spectral Power Distribution shall be optimized for high fidelity, natural color rendering.

Initial Color Consistency:	≤ 1 x 2 MacAdam Ellipses Every light source shall be within a 1 x 2 MacAdam Ellipse (1x2 SDCM) Flux and color point tuned at case temperature 70°C
Initial Color Point Accuracy:	within ± 0.0008 Δu'v' of Black Body Locus (BBL)
Color Maintenance:	Remains within 3 MacAdam Ellipses (C3) at 50,000 hours at maximum operating drive current and maximum case temperature (90°C). LM-80 data shall show Duv < 0.003 at 6,000 hours.
Lumen Maintenance:	LM better than 70% (L70, B0, F0) at 50,000 hours at maximum operating drive current and maximum case temperature (90°C). LM-80 data shall show LM > 94.8% at 6,000 hours.
Phosphor Technology:	Corrected Cold Phosphor® technology.
Warranty:	5 years, including minimum on mortality, lumen maintenance, and color maintenance. Mortality: B0 – No failures. Lumen maintenance: L70, B0 (better than 70% on all units). Color maintenance: < 0.003 Duv at 50,000 hours

DETAILED COLOR SPECIFICATIONS

IES TM-30-15 Color rendering fidelity (R_f) shall be 95.

IES TM-30-15 Color rendering gamut (R_g) shall be 101.

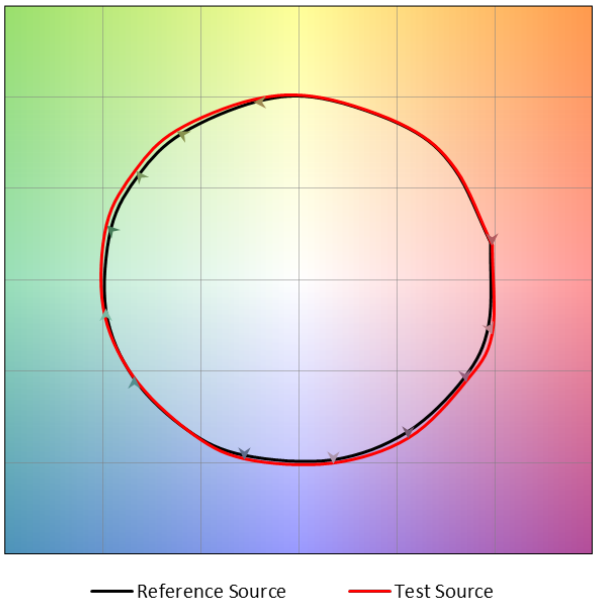
Minimum CIE CRI (Ra) shall be 95; minimum R9 shall be 90.

Typical CIE CRI R values shall be:

R1: 96	R9: 94
R2: 97	R10: 94
R3: 99	R11: 87
R4: 93	R12: 87
R5: 94	R13: 95
R6: 91	R14: 98
R7: 97	R15: 99
R8: 97	

Typical CIE CRI Gamut Area Index GAI_{BB} shall be TBD.

COLOR VECTOR GRAPHIC



LED core array shall be Xicato XCA19952220CCA.