



Light is indistinguishable  
Superb color consistency  
with TEN° binning



Light is OSRAM

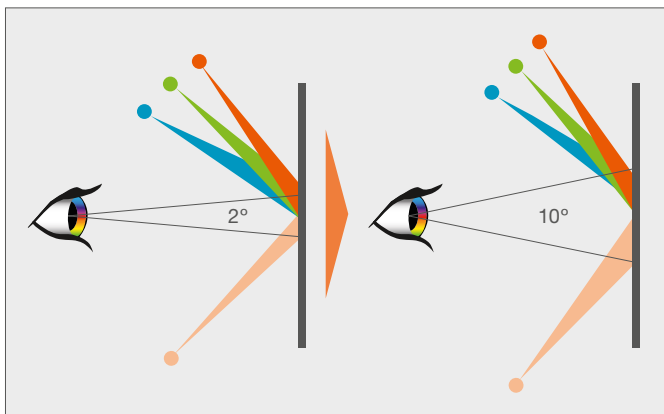
**OSRAM**  
Opto Semiconductors



## You can see the differences

OSRAM Opto Semiconductor is preparing the new TEN° binning for the SOLERIQ® S Chip on Board family which will offer unprecedented color consistency for luminaire manufacturers and lighting designers.

TEN° binning addresses color consistency by adding a more representative CIE 2015 10° observer color binning scheme to the industry standard CIE 1931 2° color space. This breakthrough is necessary to cater for the typical general lighting applications where color consistency is judged under a 10° field of view rather than 2°. Thanks to TEN° binning we can see color differences in advance – so that you can't see a difference in your luminaires or applications afterwards.



2° versus 10° observer

### The usual situation: 2° xy chromaticity diagram High risk of luminaires and applications appearing in different white colors

Imagine you are illuminating a scene with three spotlights. The white light from these three spotlights may look a bit different. This problem is caused by some inaccuracies in the CIE 1931 2° xy chromaticity diagram which everyone is using right now for LED white binning. It may happen that LEDs with different spectral compositions may be measured to have exactly the same color coordinates but the visual perception still shows color differences. These spectral differences can be caused by different converter compositions for different CRI, different generations or wavelength of the blue chip.

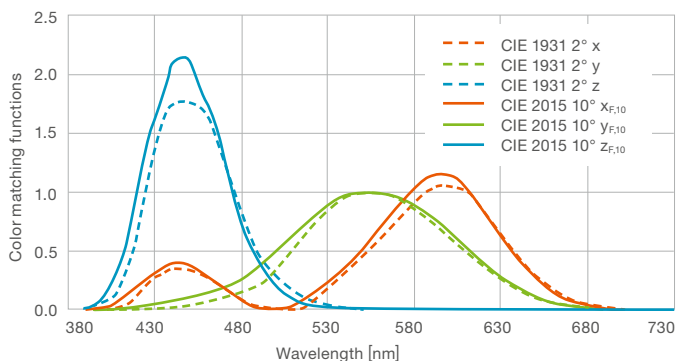
**The overdue solution: TEN° binning**

**The latest and scientific proven color space for measurement and binning**

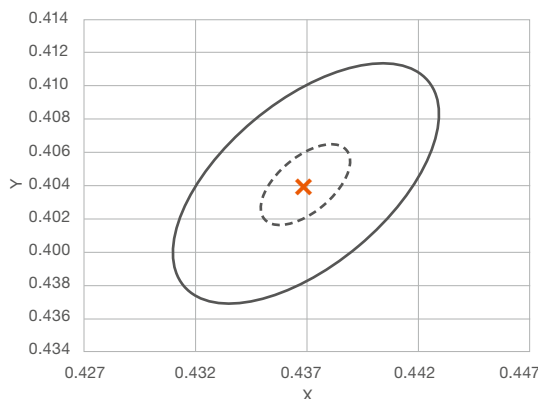
With the introduction of TEN° binning OSRAM Opto Semiconductors is also applying the recent CIE 170-2:2015 technical report to LED binning.

This report uses the latest cone fundamentals from 2006 to create a fundamental chromaticity diagram with physiological axes to ensure that visible color differences are captured in the measurements and binning.

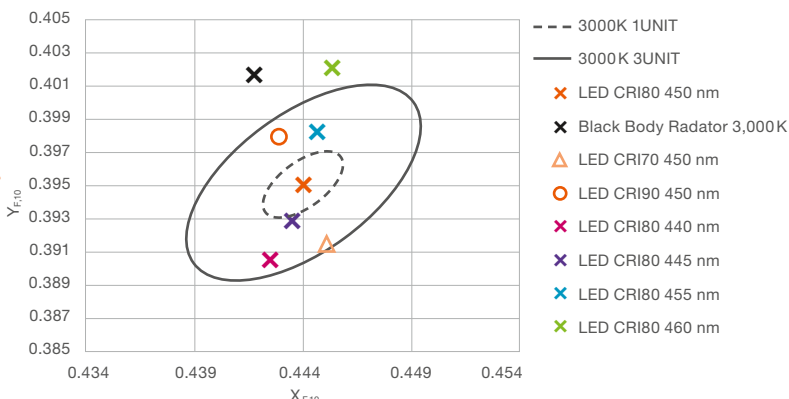
**Color matching functions for CIE 1931 2° and 2015 10° field size**



**CIE 1931 2° xy**



**CIE 2015 10° x<sub>F,10</sub> y<sub>F,10</sub>**



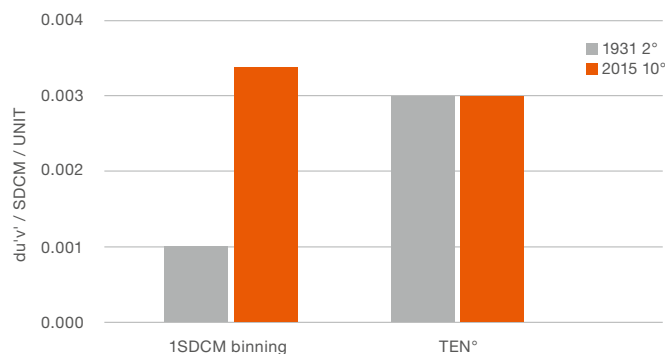
**Advantages of TEN° binning**

- Provides protection against unexpected large color discrepancies by using a more accurate color space
- Reduces the risk of visible color differences between luminaires
- Introduces a new color space based on CIE 170-2:2015 using the latest fundamental color matching functions to create a chromaticity diagram with physiological axes

- Ready to change the white binning of LEDs completely to a new color diagram
- May reduce color differences between LEDs with different CRI values, from different types and converter mixes or from different manufacturers



**Worse case color discrepancy in 1931 2° and 2015 10°**





**TEN° binning on the Internet:**  
[www.osram-os.com/ten](http://www.osram-os.com/ten)

For further information on the available products please visit our product catalog at [www.osram.com/general-lighting](http://www.osram.com/general-lighting)

**LED Light for you Network**  
[www.ledlightforyou.com](http://www.ledlightforyou.com)



**Asia**

OSRAM Opto Semiconductors  
(China) Co., Ltd.  
29/F, Harbour Ring Plaza  
No. 18 Xi Zang Middle Road,  
Shanghai, 200001 P.R.C.  
China  
E-mail: [prasia@osram-os.com](mailto:prasia@osram-os.com)

**Europe**

OSRAM Opto Semiconductors GmbH  
Leibnizstraße 4  
93055 Regensburg, Germany  
Phone: +49 941 850 1700  
Fax: +49 941 850 3302  
E-mail: [support@osram-os.com](mailto:support@osram-os.com)

**USA**

OSRAM Opto Semiconductors Inc.  
1150 Kifer Road, Suite 100  
Sunnyvale, CA 94086, USA  
Main Phone number: (408) 962-3700  
Main Fax: (408) 738-9120  
Inbound Toll Free: (866) 993-5211  
E-mail: [info@osram-os.com](mailto:info@osram-os.com)