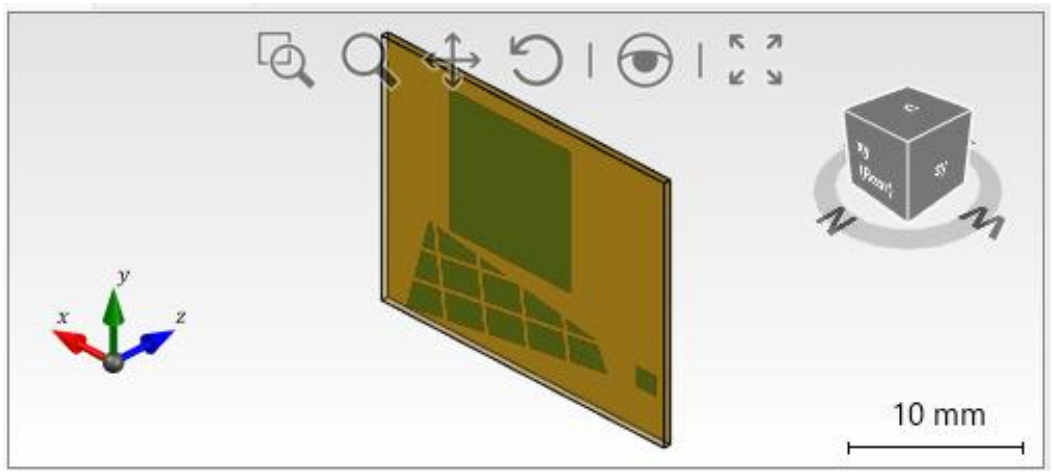
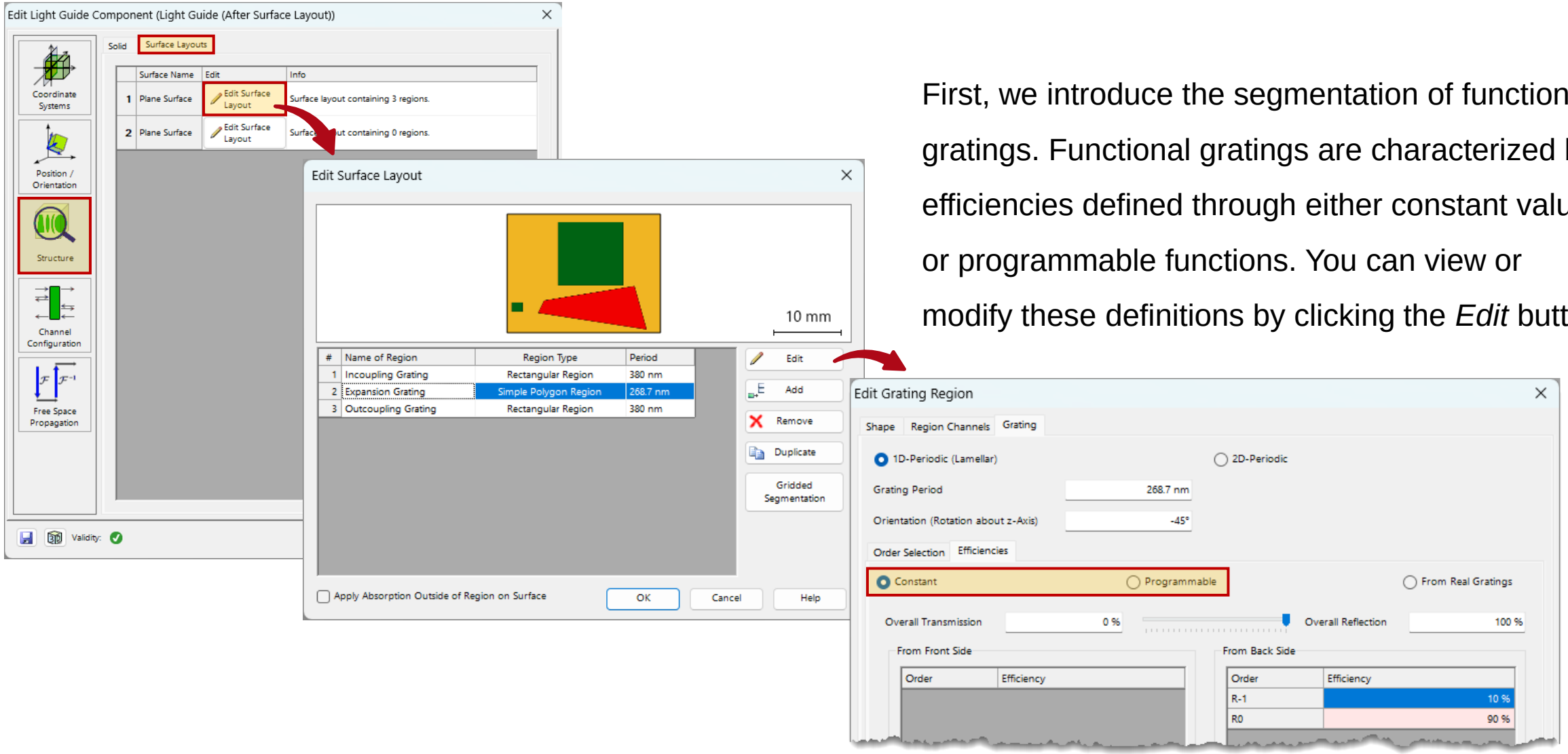
Gridded Segmentation of Grating Regions in Lightguide

Abstract



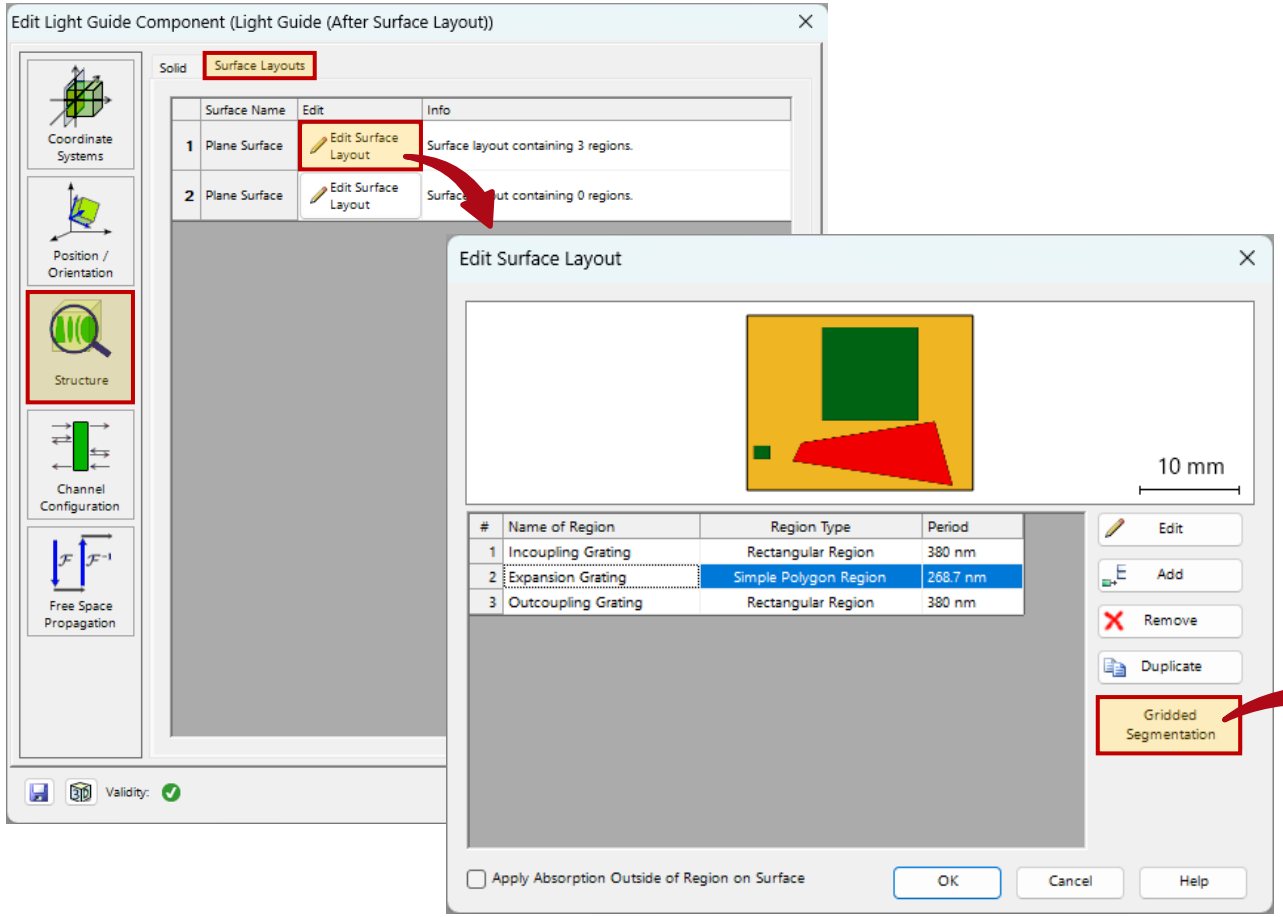
In lightguides, grating regions are sometimes implemented using gridded segmentation to facilitate specific structural or fabrication requirements. Here we demonstrate how to configure gridded segmentation within grating regions using VirtualLab Fusion.

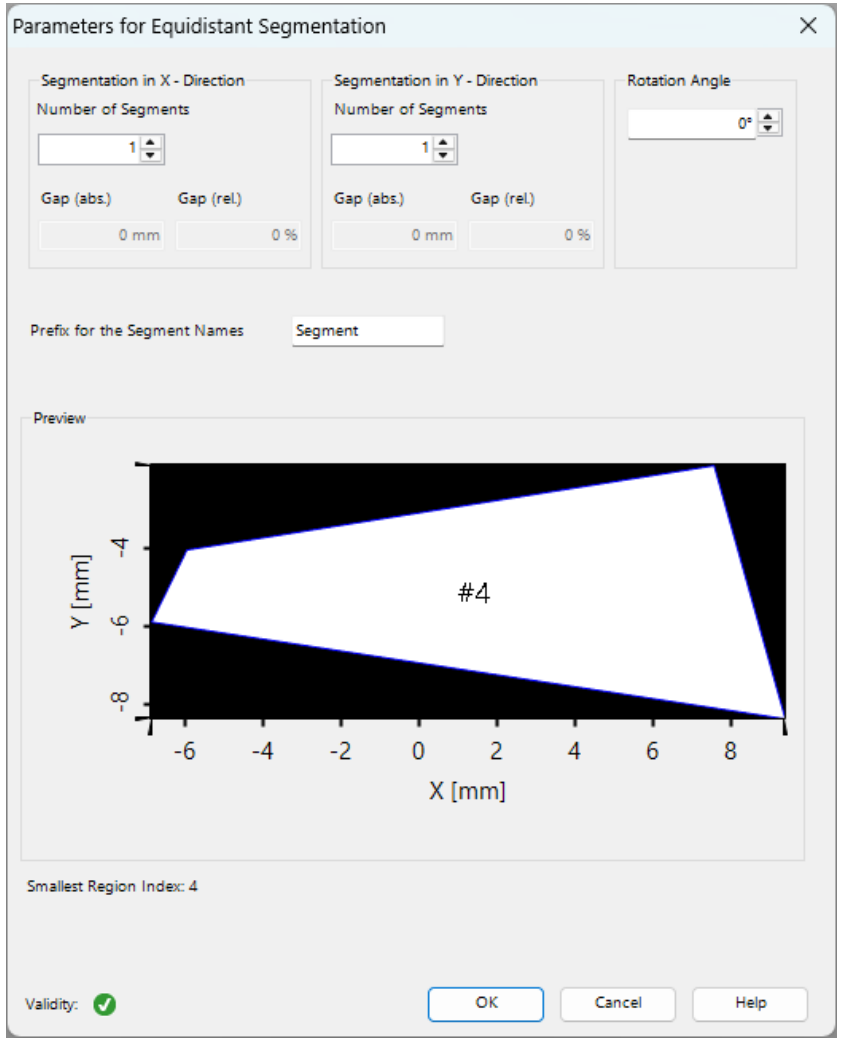
Functional Grating



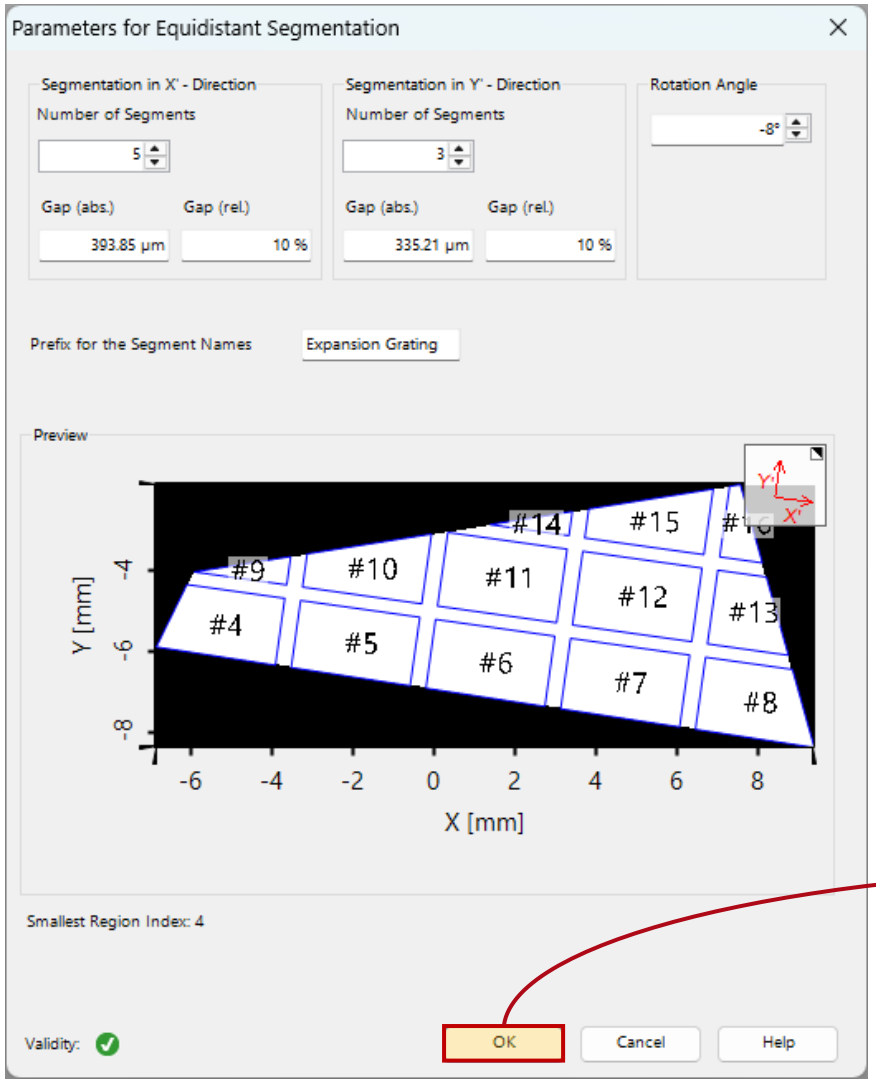
First, we introduce the segmentation of functional gratings. Functional gratings are characterized by efficiencies defined through either constant values or programmable functions. You can view or modify these definitions by clicking the *Edit* button.

Open the Gridded Segmentation Option

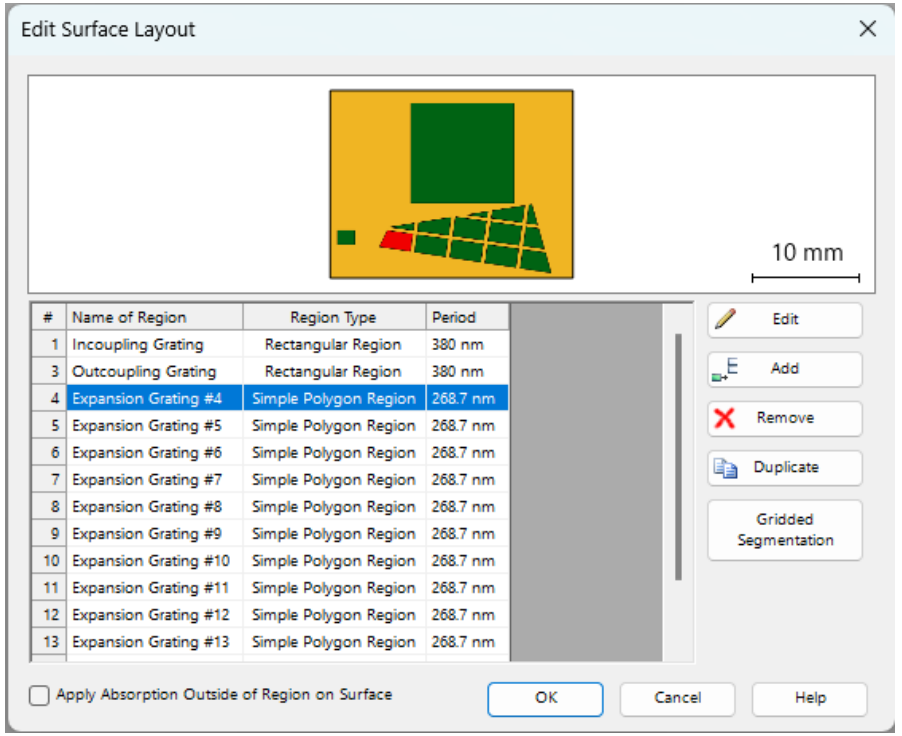




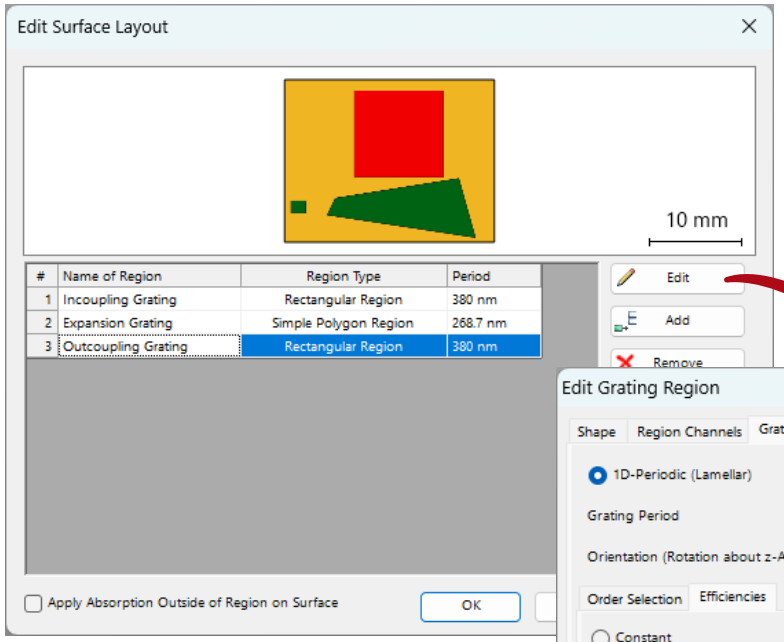
Segmentation of the Functional Grating



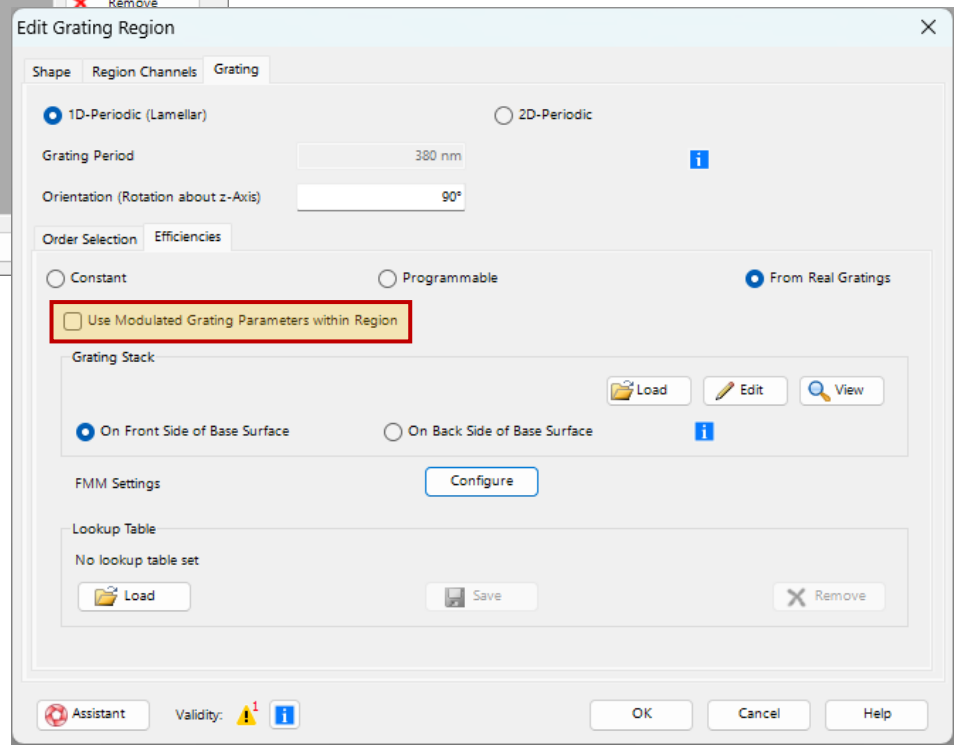
The shape of the gridded segmentation can be adjusted by modifying the *Number of Segments*, the *Gap* between them, and the *Rotation Angle*. Additionally, users can customize the segment name as needed.

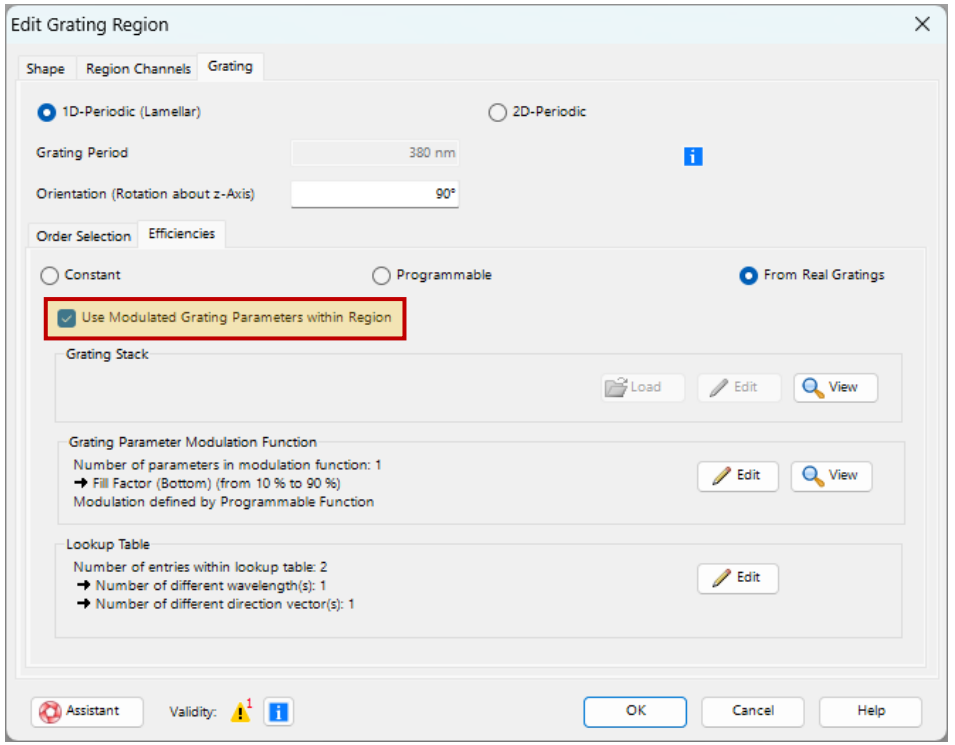


Real Grating

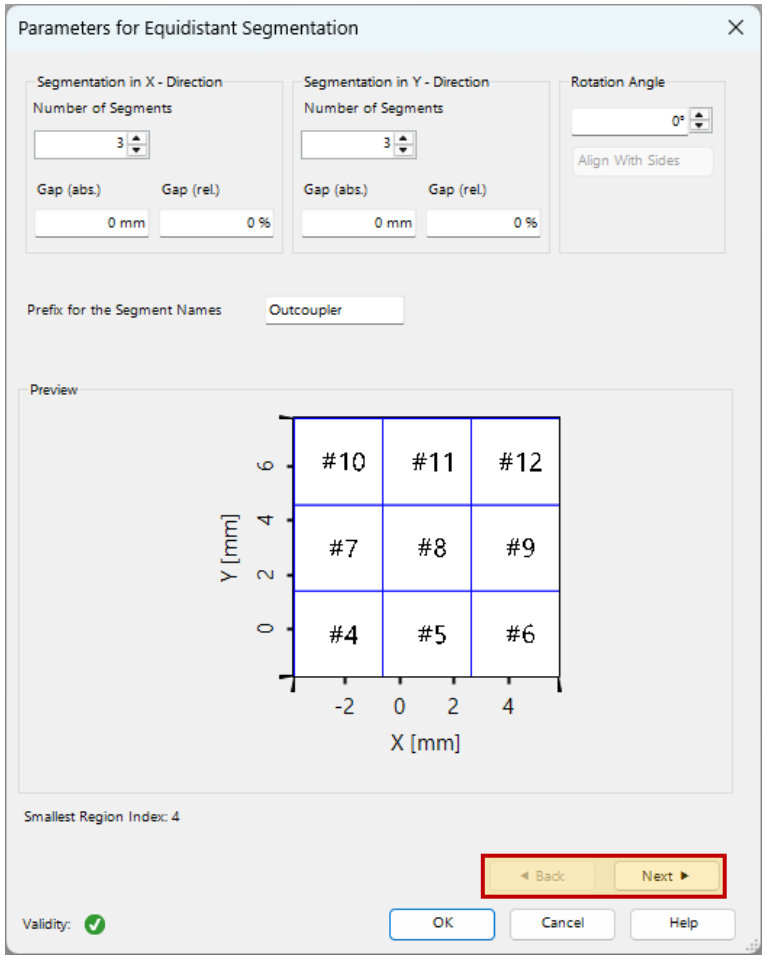


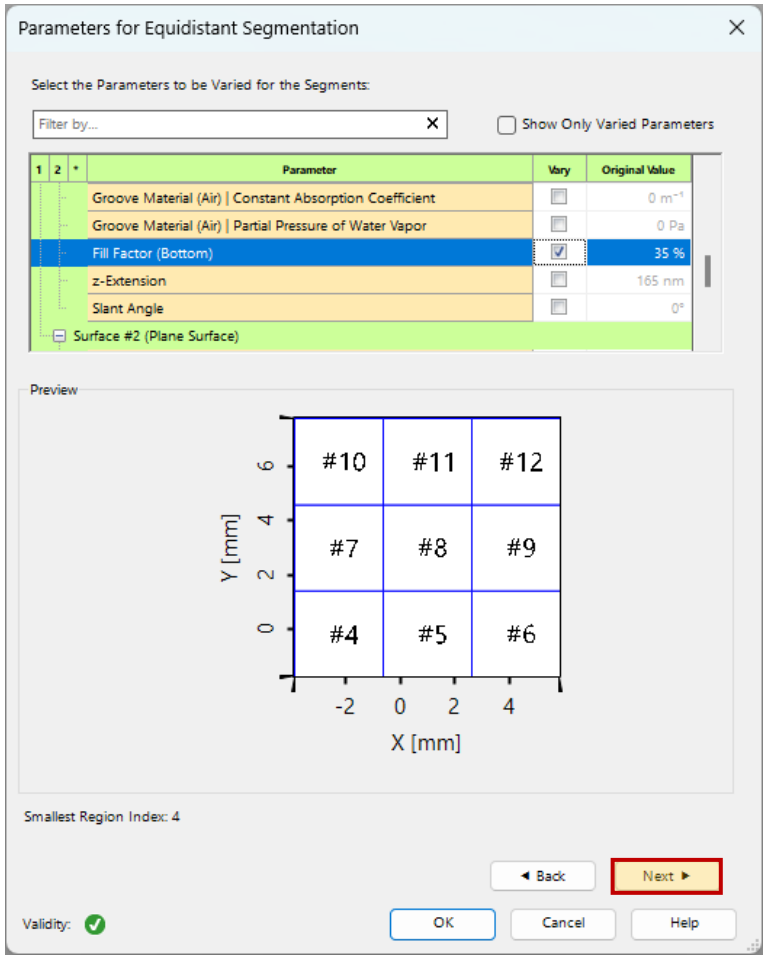
Next, we introduce the segmentation of real gratings. In this case, the efficiencies are calculated based on the electromagnetic field response of the grating structure. The structure itself can be defined directly or generated through modulated grating parameters.

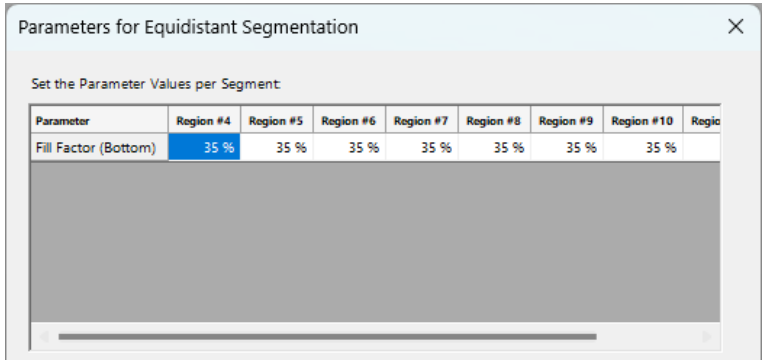




Segmentation of the Real Grating without Modulated Grating Parameters

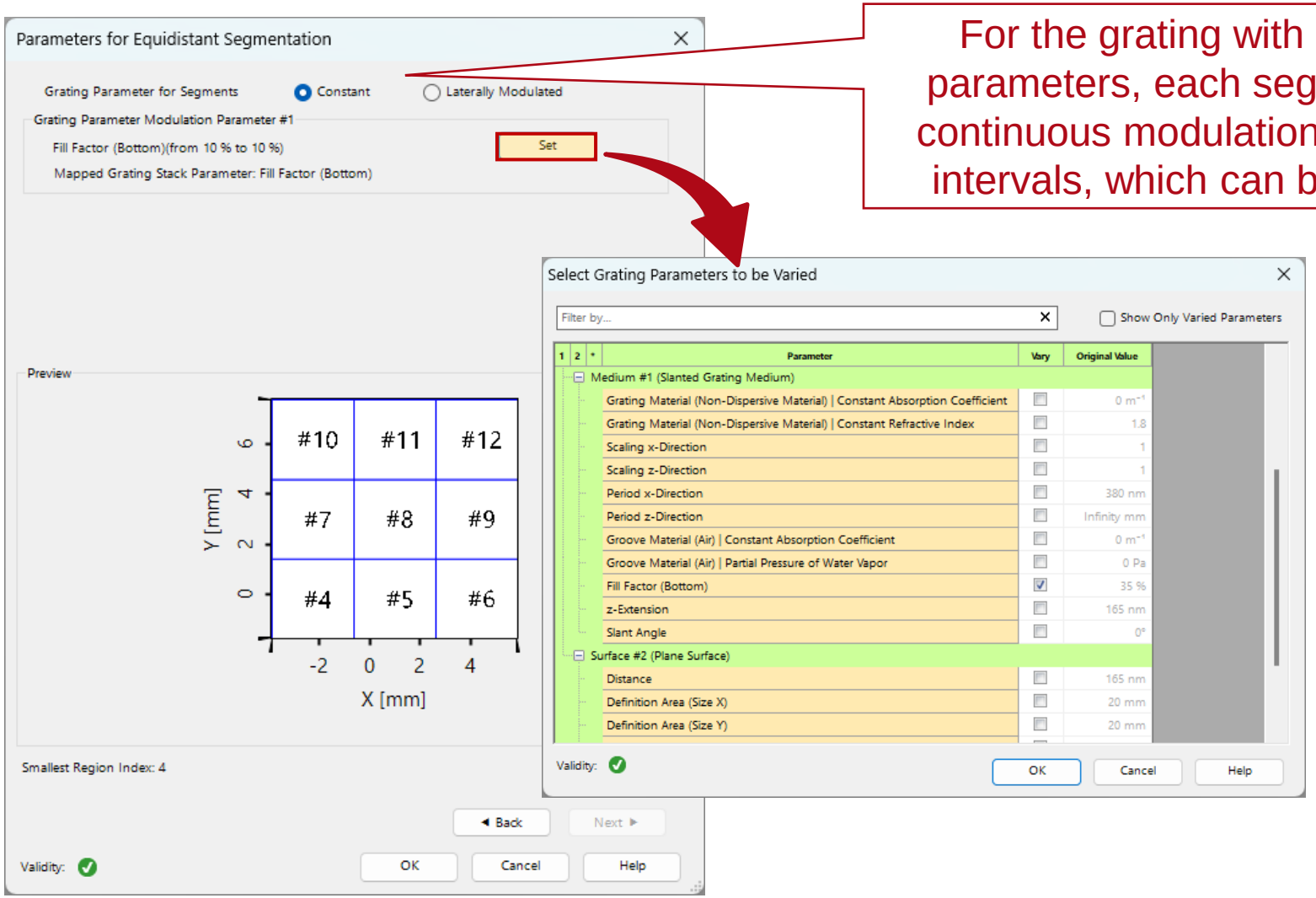






For real gratings do not involve modulated parameters, the user can choose which specific grating parameter to customize for each segment.

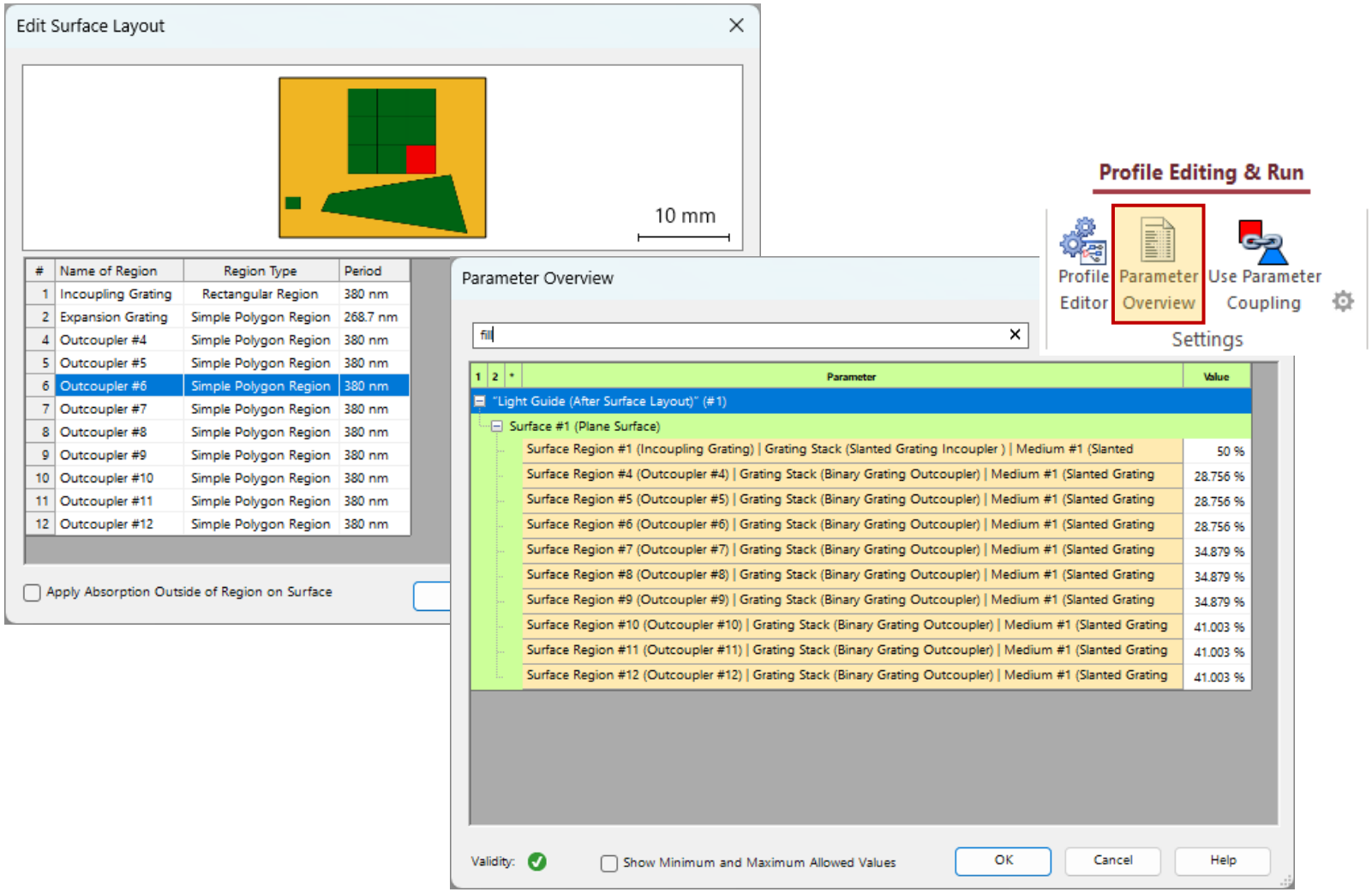
Segmentation of the Real Grating with Modulated Grating Parameters



For the grating with lateral modulated grating parameters, each segment can either maintain a continuous modulation or be divided into constant intervals, which can be calculated automatically.

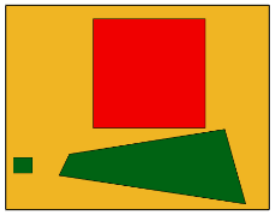
If constant interval calculation is enabled, the user can then determine which parameter from the original grating will remain fixed within each segment.

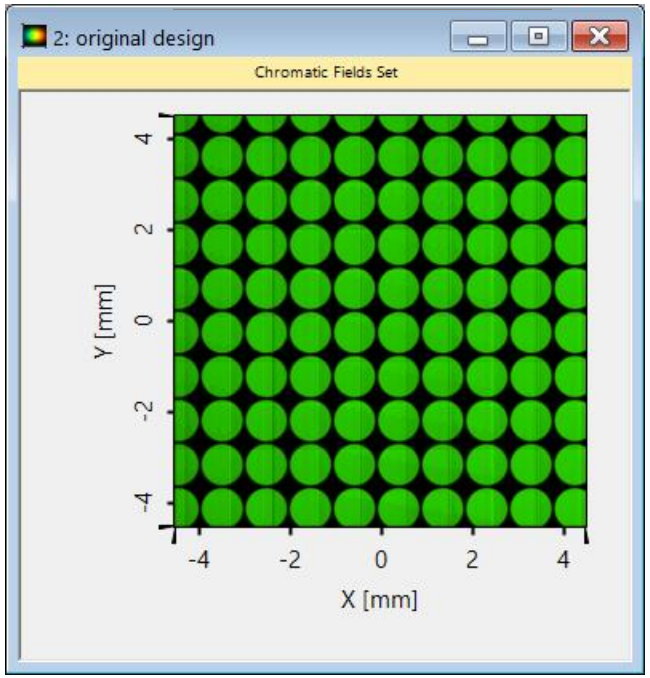
Parameter Overview of the Segmented Grating



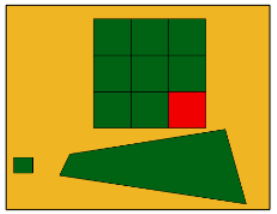
The segmented grating regions are displayed in the *Edit Surface Layout* window. In *Parameter Overview* under *Profile Editing & Run* tab, the user can view which constant values have been assigned to each segment for the selected parameter.

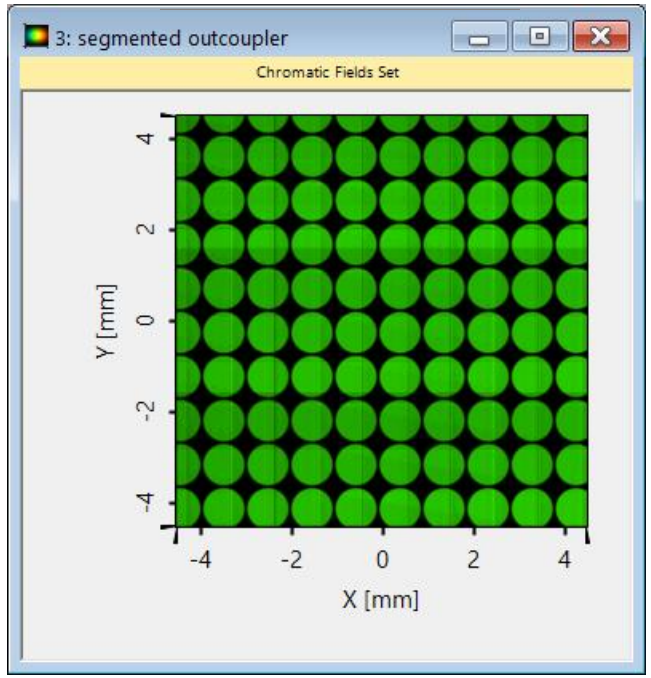
Example for Constant Intervals vs Continuously Modulation





"Uniformity Detector" (#602) (Profile: General)	Minimum	129.23 (mV/m)²
	Maximum	148.21 (mV/m)²
	Uniformity Error	6.8408 %
	Arithmetic Mean	140.38 (mV/m)²
	Standard Deviation	21.524 (mV/m)²





"Uniformity Detector" (# 602) (Profile: General)	Minimum	129.27 (mV/m)²
	Maximum	147.47 (mV/m)²
	Uniformity Error	6.5788 %
	Arithmetic Mean	140.65 (mV/m)²
	Standard Deviation	21.339 (mV/m)²

An optimized lightguide is used here as an example. The fill factor of the outcoupler is segmented as shown on the last two pages. When compared to the original design, which features a continuously varying fill factor, the detector results reveal only minor differences.

Document Information

Title	Gridded Segmentation of Grating Regions in Lightguide
Document code	TUT.0457
Publication date	08.07.2025
Required packages	- (Though Grating Package is required if the grating regions shall be filled with real gratings).
Software version	2025.1 (Build 1.172)*
Category	Tutorial
Further reading	Construction of a Light Guide Optimization of Lightguide with Continuously Modulated Grating Regions

* *The files attached to this document require the specific version or later.*