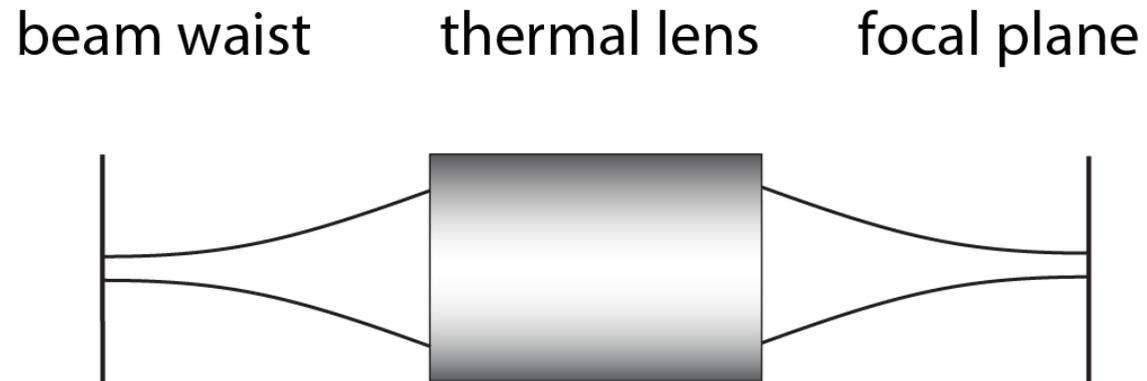


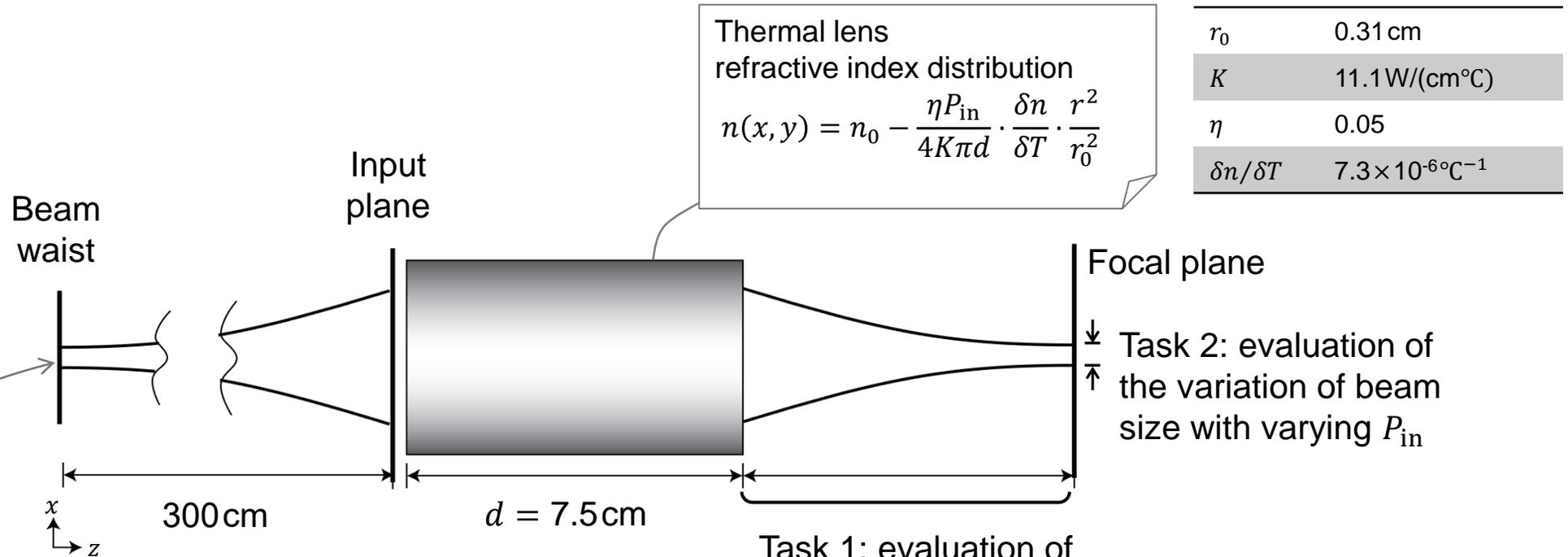
Gaussian Beam Focused by a Thermal Lens

Abstract



Thermal lens effect describes the inhomogeneity of refractive index of medium, which is induced by thermal gradient of a high-power incident laser beam. For a Gaussian beam with specified parameters, the refractive index is mathematically represented as a function of temperature and input power [W. Koechner, *Appl. Opt.* **9**, 2548–2553 (1970)]. This use case shows the variation of the focal length of the thermal lens, as well as the focus beam diameter when the input power changes. This example is published in [H. Zhong, *J. Opt. Soc. Am. A* **35**].

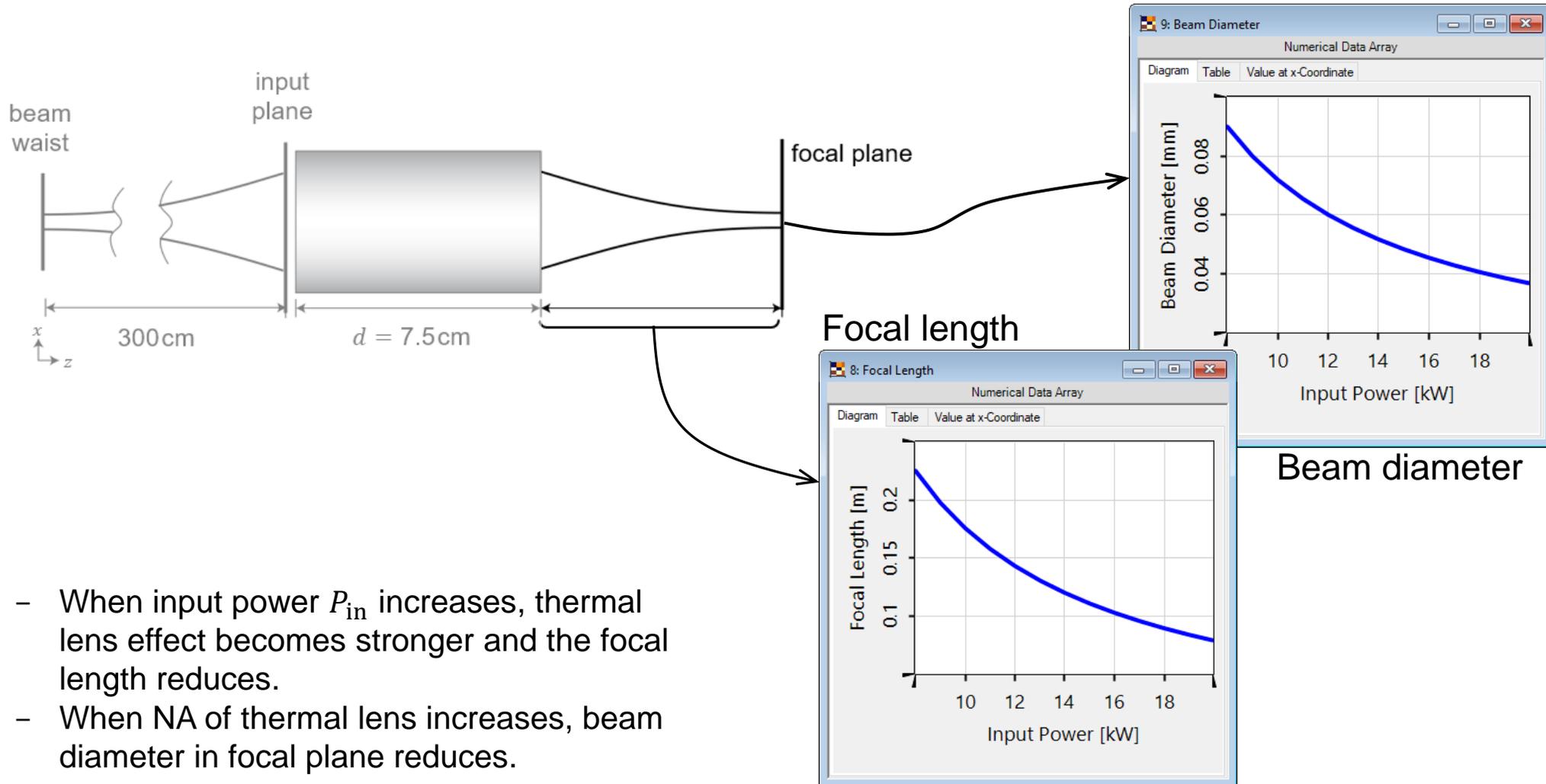
Modeling Task



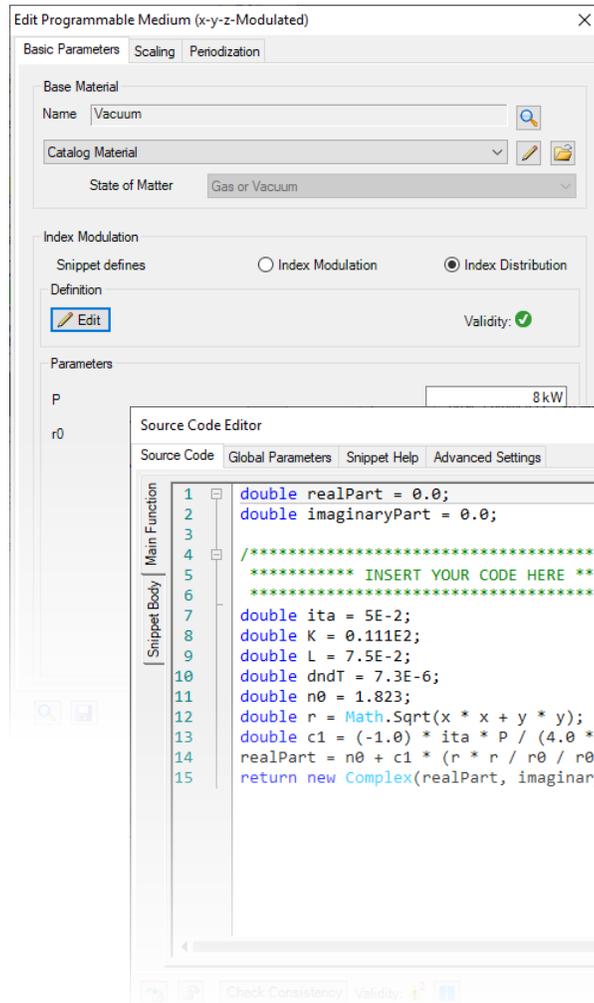
r_0	0.31 cm
K	11.1 W/(cm°C)
η	0.05
$\delta n/\delta T$	$7.3 \times 10^{-6} \text{ °C}^{-1}$

Fundamental Gaussian mode	
Wavelength	632.8 nm
Polarization	Linear in x-direction
Waist radius	760 μm
Input power P_{in}	8 to 20 kW

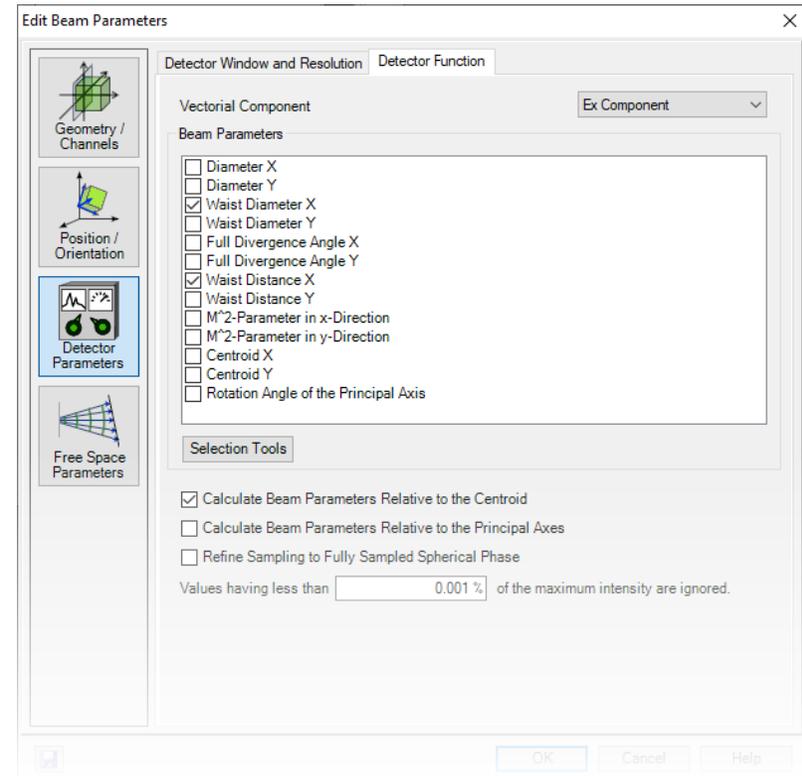
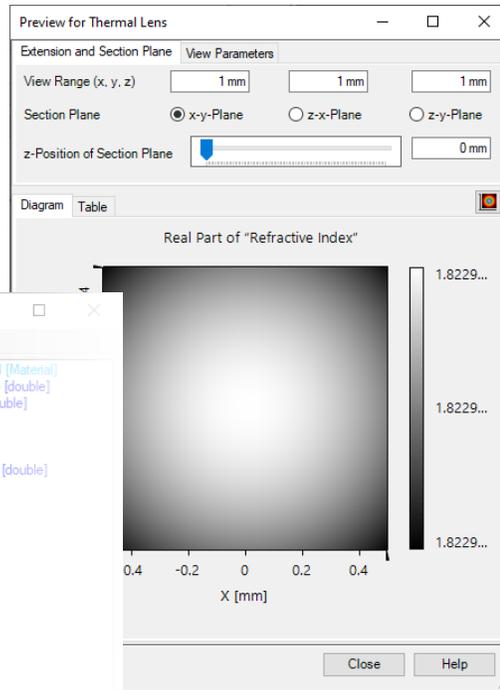
Results



Peek into VirtualLab Fusion



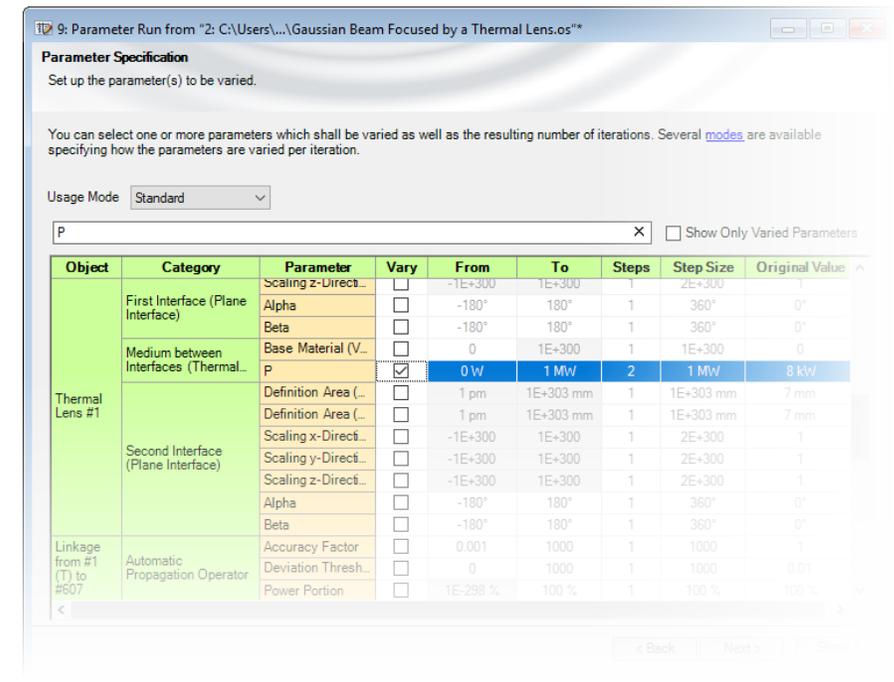
Customizable
graded-index
media



Detector for Gaussian beam
parameters

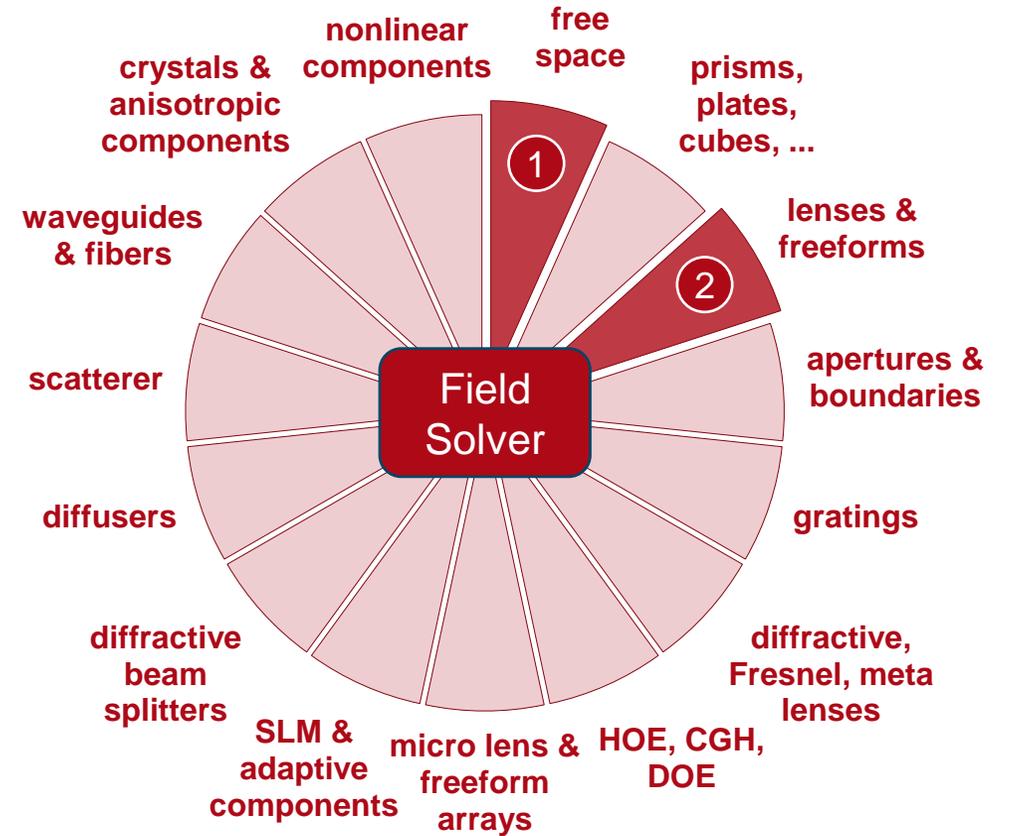
Workflow in VirtualLab Fusion

- Set up input Gaussian field
 - [Basic Source Models](#) [Tutorial Video]
- Customize the graded-index medium
 - [How to Work with the Programmable Medium and Example \(Thermal Lens\)](#) [Use Case]
- Use the Parameter Run
 - [Usage of Parameter Run](#) [Use Case]



VirtualLab Fusion Technologies

beam waist thermal lens focal plane



idealized component

Document Information

title	Gaussian Beam Focused by a Thermal Lens
document code	GRIN.0004
version	1.2
edition	VirtualLab Fusion Basic
software version	2020.1 (Build 1.202)
category	Application Use Case
further reading	<ul style="list-style-type: none">- <u>Construction and Modeling of a Graded-Index Lens</u>- <u>Modeling of Graded-Index (GRIN) Multimode Fiber</u>