Focus Investigation behind Aspherical Lens
Abstract

High-power laser diodes often show asymmetric divergence and astigmatism between two directions. As an example, a laser diode is firstly collimated by an objective, then focused by an aspherical lens, and the evolution of the field in focal region is investigated in VirtualLab. The influence from the astigmatism on the field in focal region is clearly presented, with comparison to the case without astigmatism.
Modeling Task

What is the field in focal region behind an aspherical lens? Especially, the astigmatism of the laser diode must be taken into account.

Laser Components
WSLD-1064-050m-1-PD
- fundamental Gaussian
- wavelength 1064 nm
- divergence (FWHM) 20° × 10°
- astigmatism 11.6 µm between x- and y-plane
Results

• Ray tracing – system in 3D space

Ray-tracing analysis provides a fast overview of the system in space.
Results

- Field tracing

A high-NA laser diode with or without astigmatism was used. Physical-optics simulation of the whole system, including collimation and focusing lenses, takes only 2 seconds!

<table>
<thead>
<tr>
<th>diameter</th>
<th>With astigmatism</th>
<th>Without astigmatism</th>
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<tbody>
<tr>
<td>x direction</td>
<td>11.80 µm</td>
<td>11.41 µm</td>
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<tr>
<td>y direction</td>
<td>21.48 µm</td>
<td>19.23 µm</td>
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</table>
Results

• Field tracing

Physical-optics simulation of field evaluation within focal region, over 30 steps, takes about 90 seconds.

high-NA laser diode without astigmatism
Results

- Field tracing

Minimum beam diameters appear at different positions along $x$ and $y$ directions, due to astigmatism of the laser diode.
Results

- Field tracing

quantitative measurement of the evolution of beam diameters in both directions

high-NA laser diode with or w/o astigmatism

![Graphs showing beam diameter changes with and without astigmatism.](image)
## Document Information

<table>
<thead>
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