Tight Focusing Through a Stratified Medium
Abstract

In the real-life experiment, a coverslip is very often applied with a microscope for observing biological specimens. The focal spot of the high-NA objective could be influenced by the aberration introduced by the coverslip. In VirtualLab Fusion, the influence of the focal spot by the coverslip can be analyzed straightforwardly with a stratified medium. The aberrated focal spot is demonstrated and analyzed in this use case.
Scenario

plane wave
- wavelength 532 nm
- circularly polarized

How is the focal spot, defined by the energy density, influenced by the coverslip?
Building the System in VirtualLab Fusion
System Building Blocks

high-NA objective US04384765 (NA≈0.95)
Solvers for Components

high-NA objective US04384765 (NA≈0.95)
## Summary

<table>
<thead>
<tr>
<th>Components</th>
<th>Solvers</th>
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<tr>
<td>Lens Systems</td>
<td>Local Plane Interface Approximation (LPIA)</td>
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<td>Coverslip</td>
<td>S-matrix for stratified medium</td>
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Geometric-Optics Simulations

by Ray Tracing
Results: Ray Tracing
Fast Physical-Optics Simulations

by Field Tracing
Focusing through the Coverslip into the Medium

By comparing the original focal spot in air, the focal spot influenced by the aberration is clearly demonstrated.

original focal spot in air
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<tr>
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<td>edition</td>
<td>VirtualLab Fusion Basic</td>
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<td>category</td>
<td>Application Use Case</td>
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**further reading**
- [Debye-Wolf Integral Calculator](#)
- [Analyzing High-NA Objective Lens](#)
- [Resolution Investigation for Microscope Objective Lenses by Rayleigh Criterion](#)