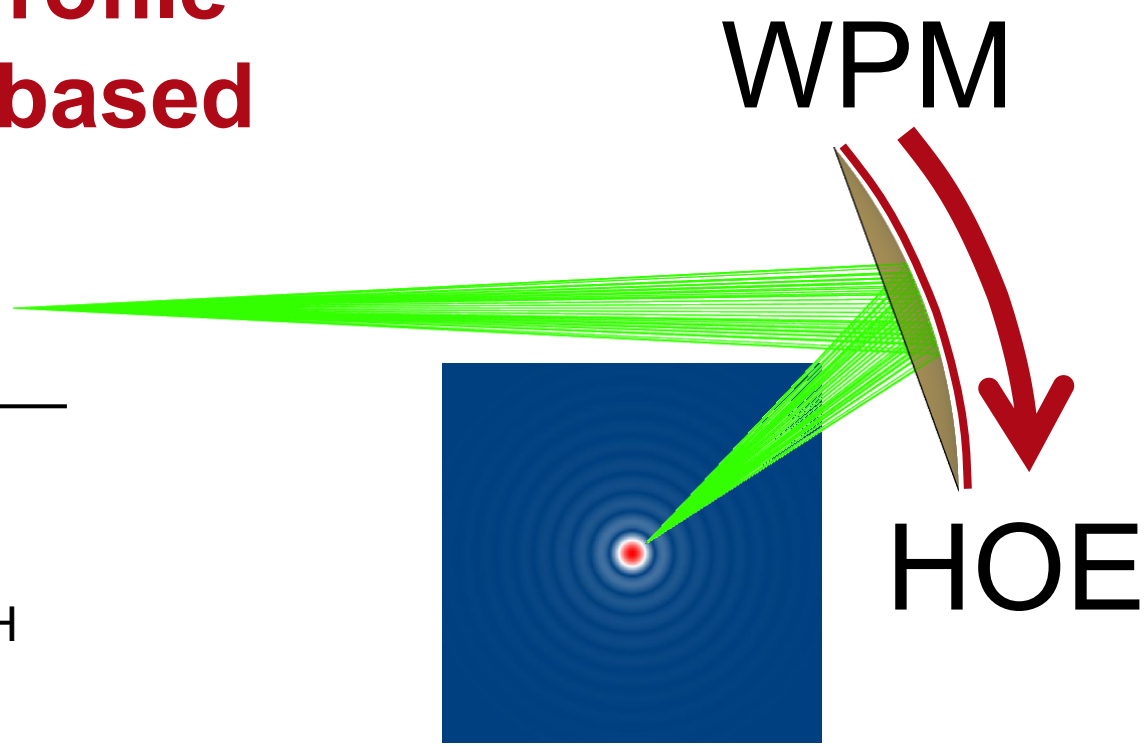
Transfer Wavefront Phase Profile to HOE Twin for a Structure-based Off-Axis Focusing

from WPM to HOE



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Author	LightTrans International GmbH
SW Package:	VirtualLab Fusion Platform
SW Version:	2026.2 (Build 3.30)

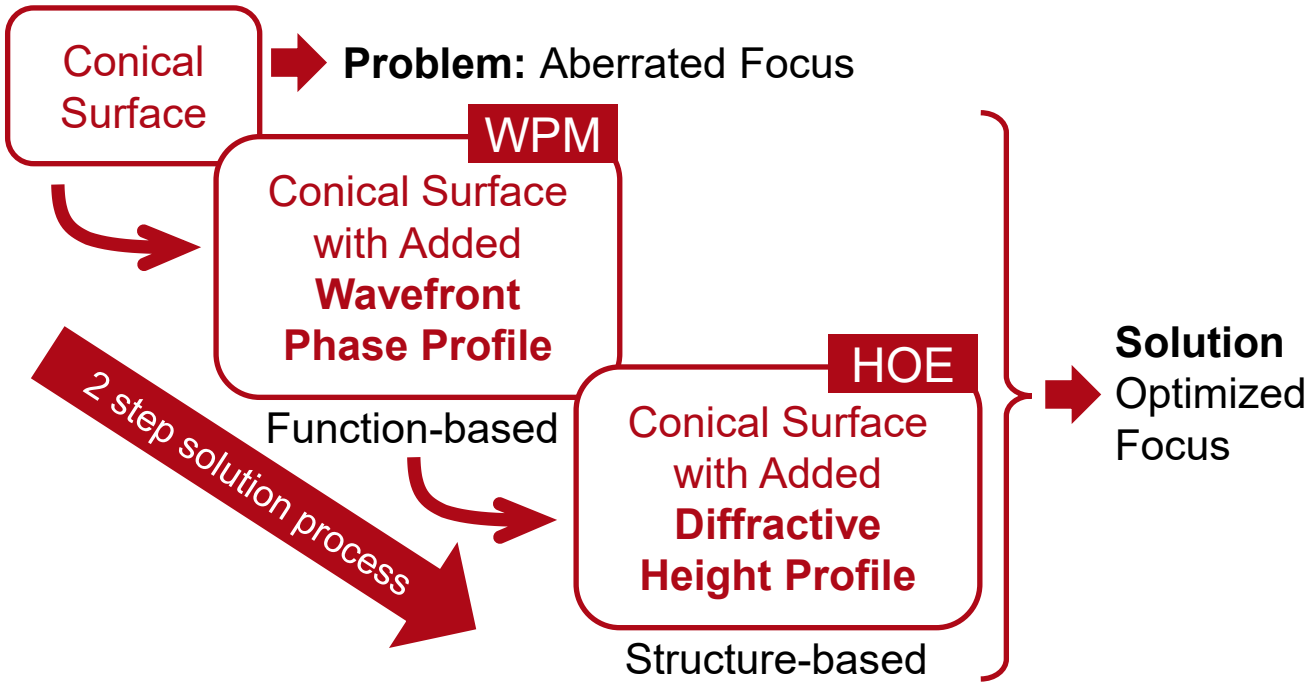
Scenario

Goal

A spherical wave with 5mm diameter should be focused at a distance of 20mm by a 20° tilted conical mirror with aberration-correcting diffractive structures.

Two-Step Solution

1. The required wavefront correction is identified and applied in a function-based way with one of our Wavefront Phase Modifier (WPM) twins.
   → see other feature demo from the resources page.
2. The obtained wavefront correction is applied to a structure-based HOE twin
   This second step is shown here.



Starting Point

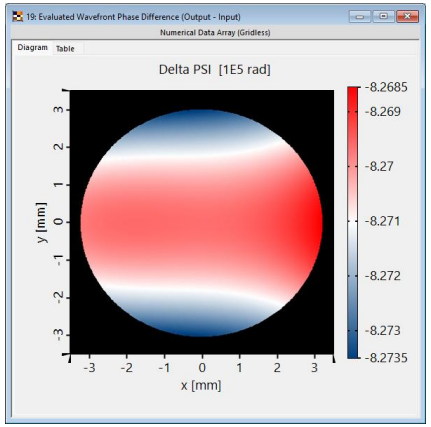
Known Required Wavefront Phase Determined and Provided by a WPM Twin

- Using the *Wavefront Phase Modifier [Surface, Output-Defined]* twin, the required wavefront difference was calculated, which eliminates the aberrations and ensures an optimal focal spot.

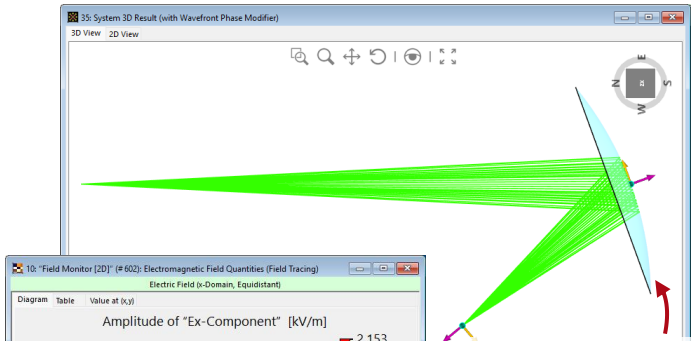
$$\Delta\psi = \psi_{\text{desired out}} - \psi_{\text{in}}$$

- This is a solution at the functional level.

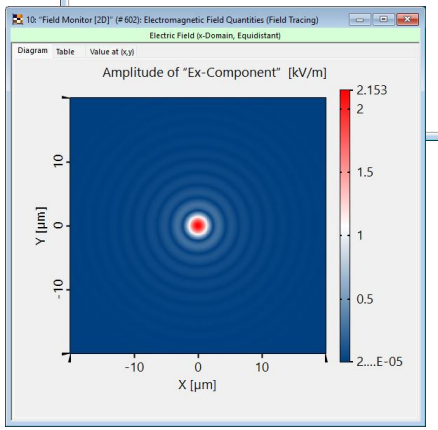
- Now let's use the determined data for the holographic optical element (HOE) and simulate it using its structural description.



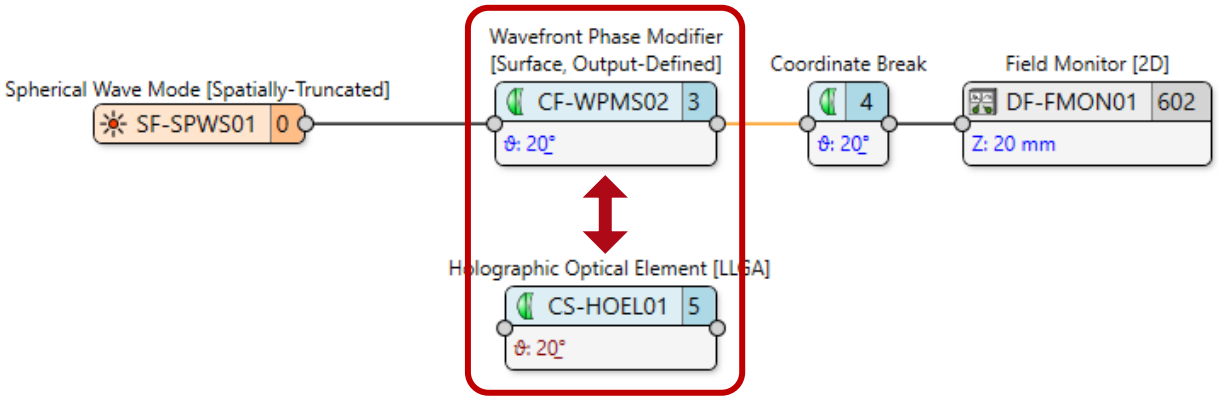
Added correction of the wavefront phase profile ($\Delta\psi$)



WPM twin with phase correction on conical surface



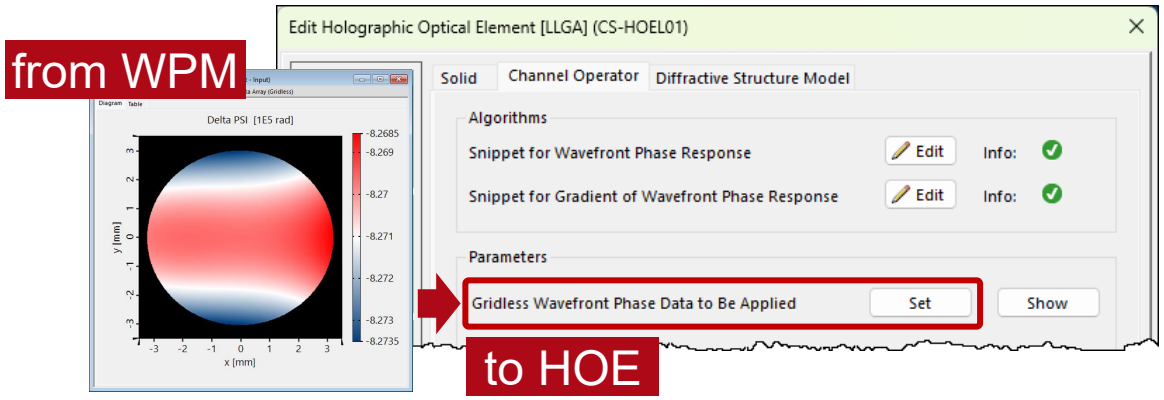
Corrected focus spot by WPM

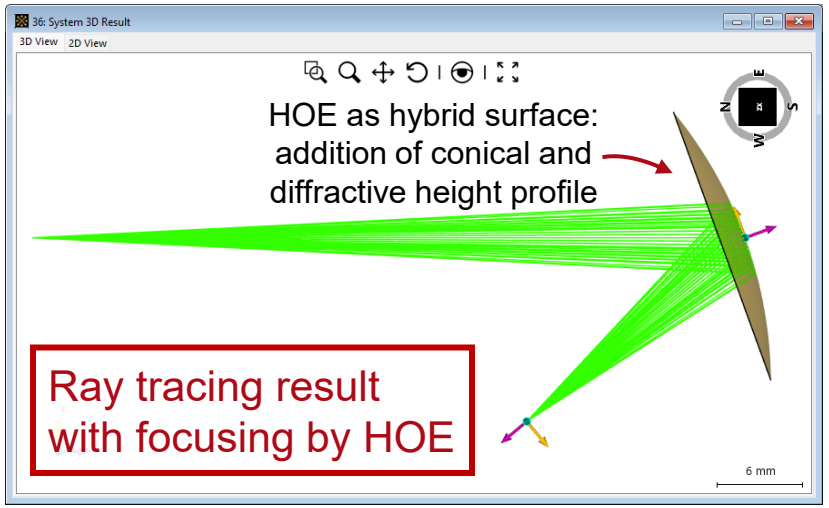


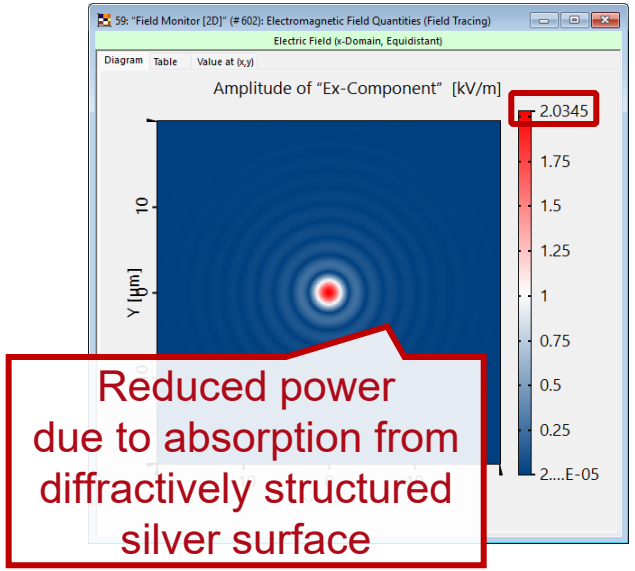
Simulation Results after Transferring WPM Data to HOE

Easy Transfer and Quick Simulation

- The required wavefront phase profile obtained by the simulation with the WPM can be inserted directly into the prepared HOE twin.
- The HOE now represents a hybrid surface, consisting of the smooth conical mirror plus the diffractive wavefront-phase-correcting surface.



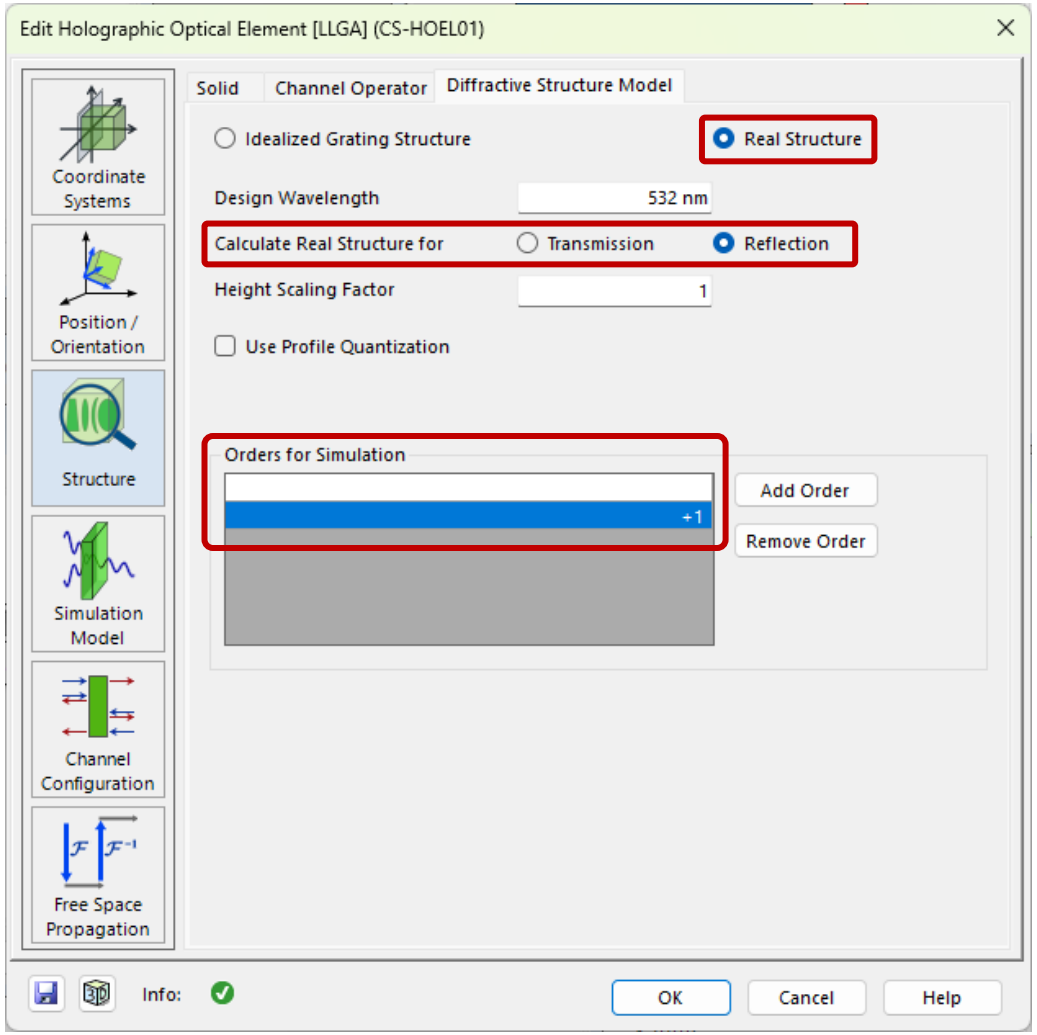




Workflow

What the User Does

1. Take the correcting wavefront phase profile data from the system simulation with the WPM.
2. Exchange the WPM twin for the given HOE twin. The code inside this HOE is meant to take the wavefront data from a WPM as input.
3. Make sure that the HOE is correctly configured (including the smooth surface, the material, real-structure mode for reflection, and working order +1)
4. Run the simulation and inspect the corrected focal spot.



Related Documents

Use Cases and Feature Demos

- FD-WPM-REFL: Off-Axis Focus Correction for a Reflective Conical Surface
- Wavefront Error Detector
- Aberration Control via Metalens
- Wavefront Phase Modifier Twins (Collimation)
- Transfer Wavefront Phase Profile to a Metalens

Tutorials

- Wavefront Phase Modifiers

Marketing Picture

Transfer data
for desired wavefront phase changes $\Delta\psi$
evaluated by WPM twin to HOE twin
for **structure-based simulations**