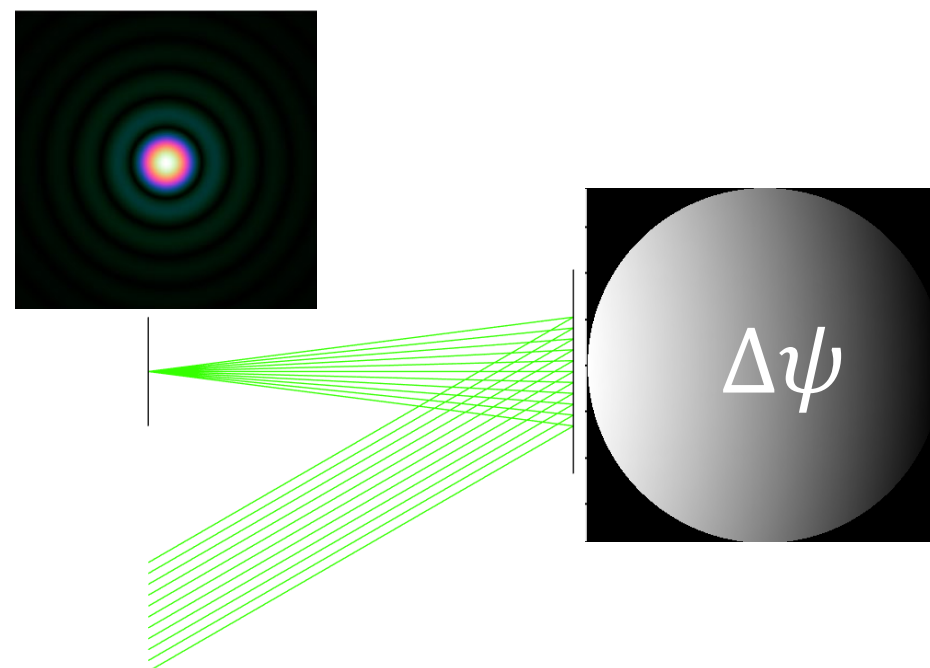


Volume Hologram Recording and Reconstruction

via Wavefront Phase Modifier Twin

Doc. ID:	FD-WPM-HOLOGRAM
Doc. Version:	1.0
Date:	September, 23, 2026
Author	LightTrans International GmbH
SW Package:	VirtualLab Fusion Platform
SW Version:	2026.2 (Build 3.30)



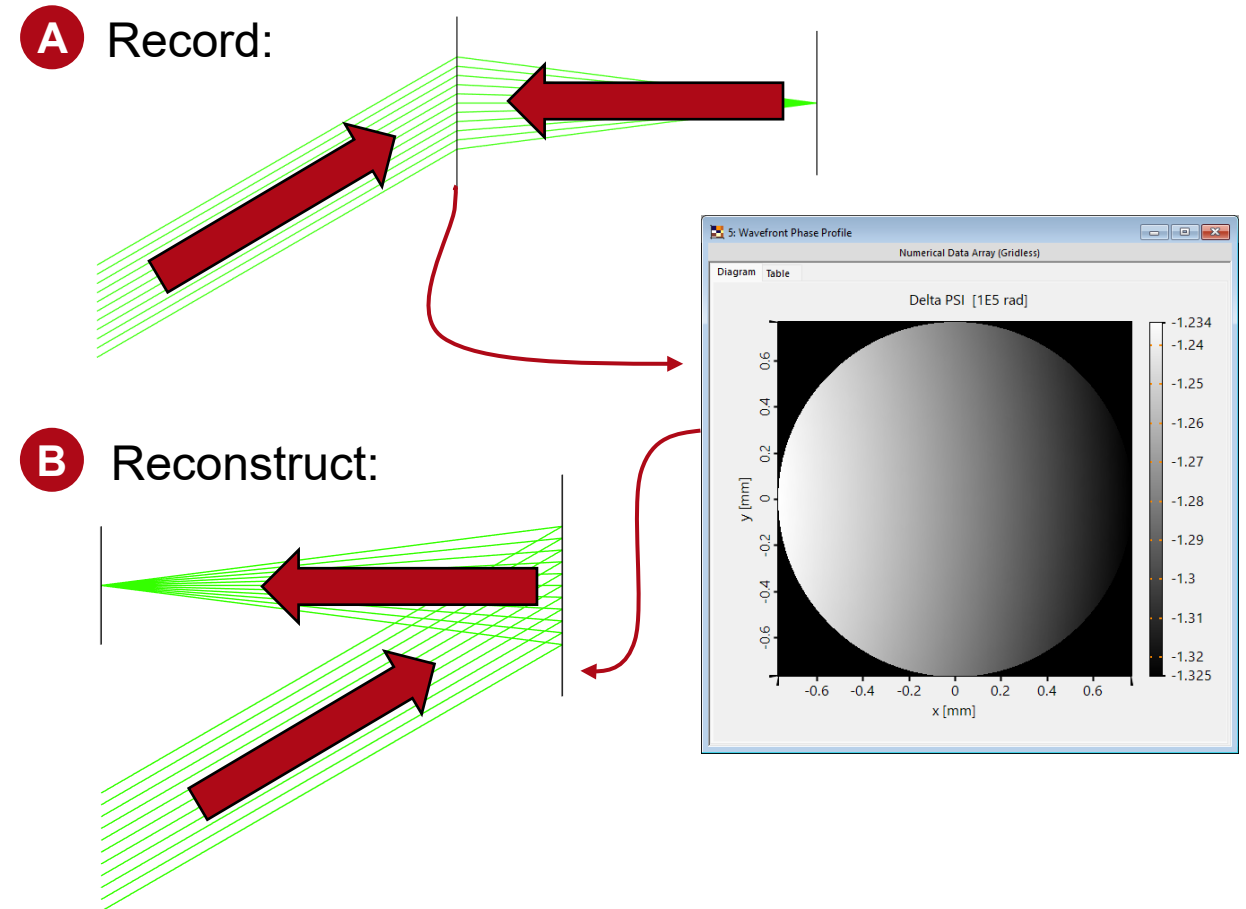
Scenario

Goal

An off-axis plane wave shall be transformed into a spherical wave by a volume hologram. We calculate the necessary wavefront profile in a recording setup and then reconstruct the spherical wave in a reconstruction setup(*).

Workflow

1. **Record:** Define the input wavefront and the desired spherical output wavefront. The WPM(*) twin determines the required phase change $\Delta\psi$.
2. **Reconstruct & Evaluate:** Load the calculated $\Delta\psi$ and apply it to the off-axis plane wave. The output will be a reconstructed spherical wave.

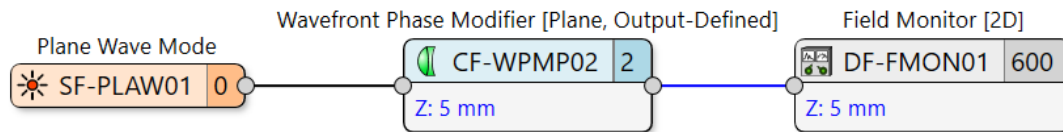


Example: Reflective Hologram

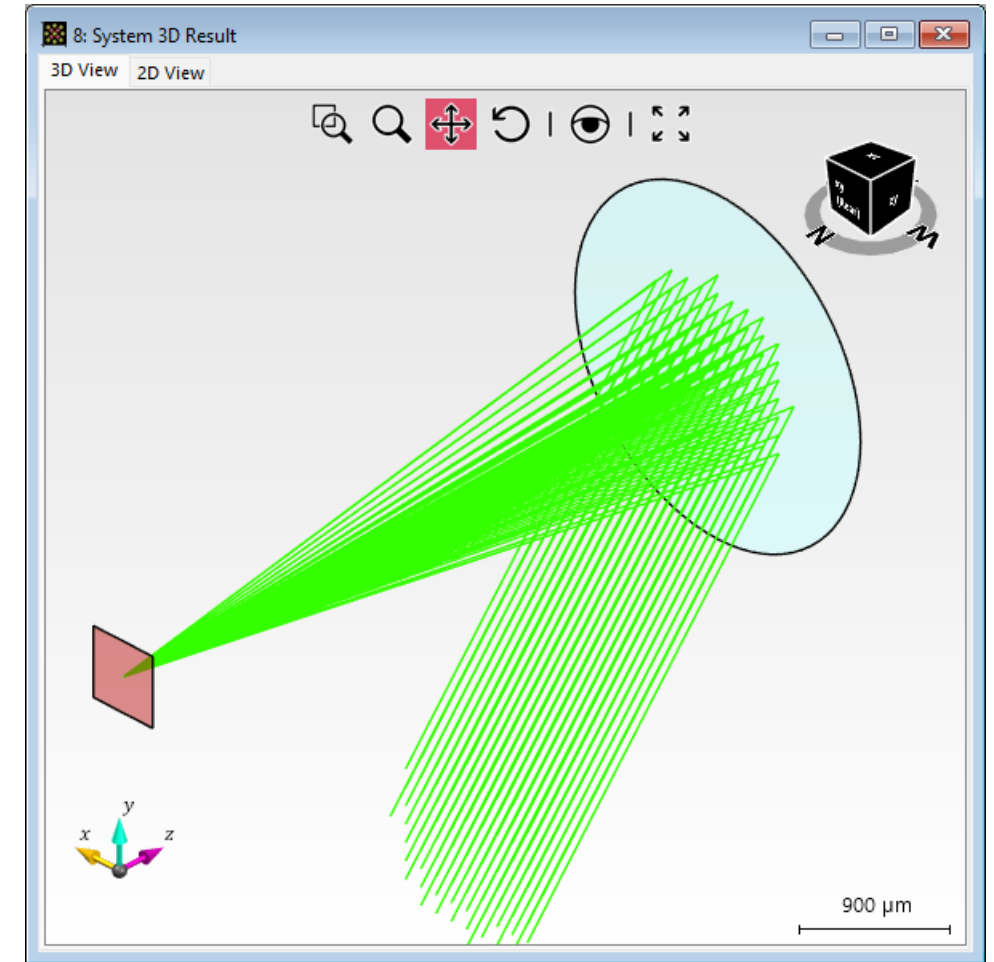
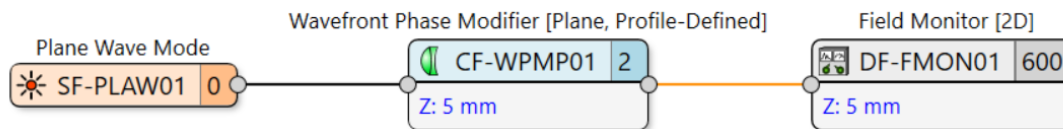
Demonstrated Optical Setup

Component	Specification
Source	Plane Wave, 532 nm, 30° inclination angle
Hologram	Represented via Wavefront Phase Modifier
Desired input	Tilted planar wavefront, 30°
Desired output	Spherical wavefront, 5 mm focal length

Recording:



Reconstruction:



Recording of the Volume Hologram

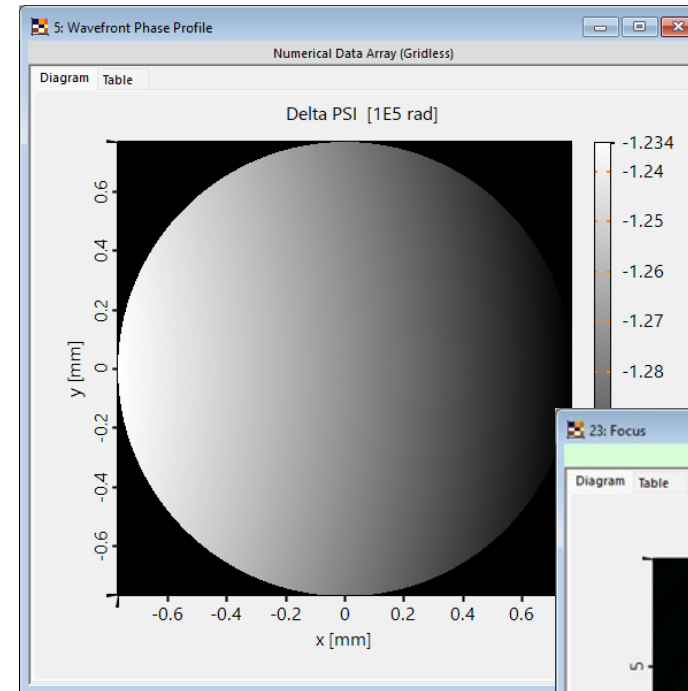
Hologram Recording & Reconstruction

Recording Result

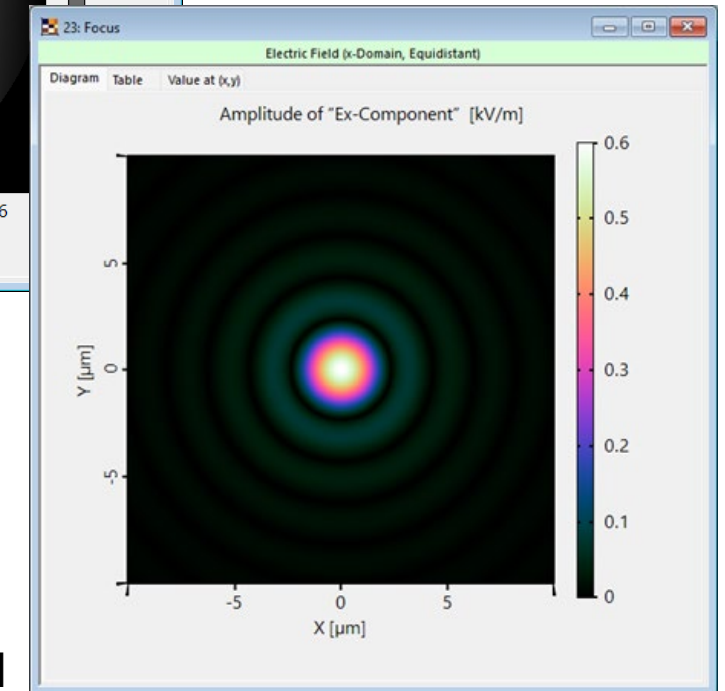
A smooth wavefront phase profile is obtained for the transformation from an inclined plane wave to the desired spherical wave.

Reconstruction Result

Applying the recorded wavefront phase profile successfully reconstructs the spherical wave. At the detector plane, a well-defined Airy pattern confirms the desired focusing behavior.



Wavefront Profile



Focal Field

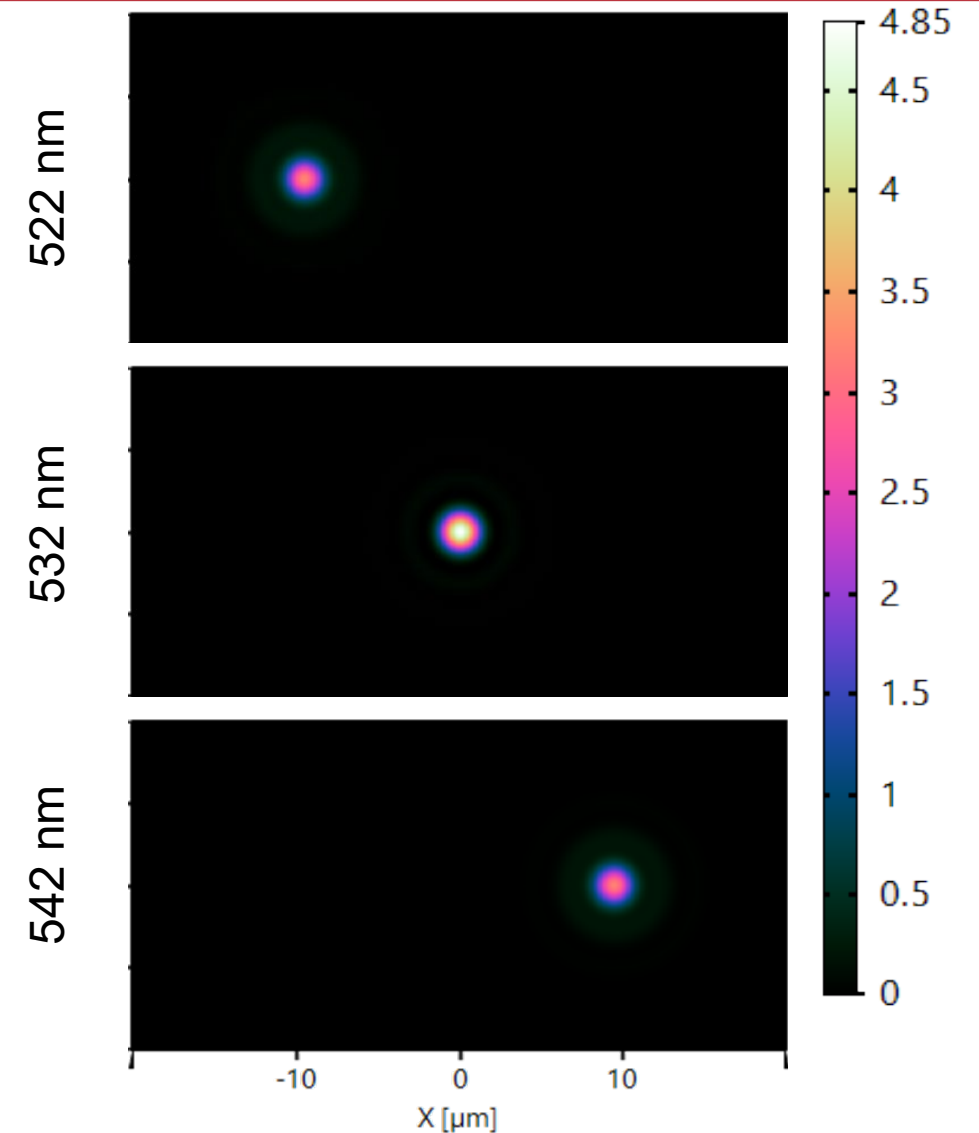
Wavelength Tolerancing

Performance at Off-Design Wavelengths

- The hologram was originally designed for a wavelength of 532 nm
- Reconstruction was repeated at 522 nm and 542 nm to investigate its spectral sensitivity

Observed Effects

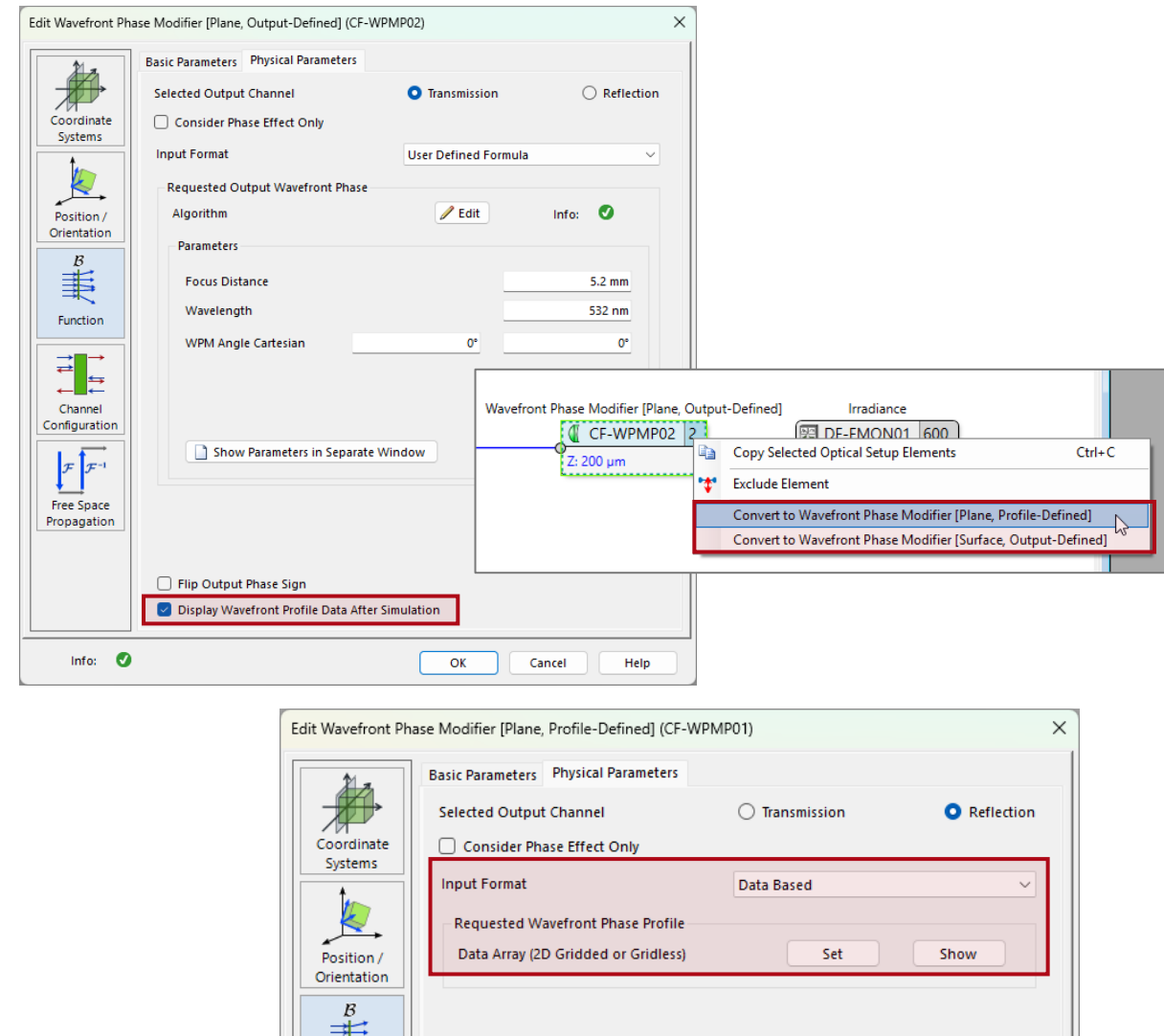
- Off-design wavelengths lead to a reduction in diffraction efficiency.
- The reconstructed focal spot shows a slight wavelength-dependent shift



Workflow

What the User Does

1. Load the Plane Wave Mode, Wavefront Phase Modifier [Plane, Output-Defined] and Irradiance twins and arrange them according to page 3.
2. Inside the WPM twin define a spherical wave output (see sample files for reference).
3. Simulate the system. Display the Wavefront Profile Data.
4. Convert WPM twin to Profile-Defined. Inside the twin change Input Format to Data Based and load the wavefront profile from step 3.
5. Adjust System according to page 3 – Reconstruction System. Repeat the simulation.



Continue Exploring

Try Related Feature Demos:

- Explore an [off-axis focusing example](#) using the same Wavefront Phase Modifier twin as in this demo.
- See how the same off-axis focusing task can be realized with a [holographic optical element](#) instead.

Theoretical Background:

- For an indepth dive into our [Wavefront Phase Modifier](#) technology, we have uploaded a whitepaper.

Learn the Basics:

- [Get started](#) with configuring and using the Wavefront Phase Modifier twins in our tutorial.

Related Paper:

- Have a look into [this paper](#) to get an deeper understanding of the principles behind this demonstration.