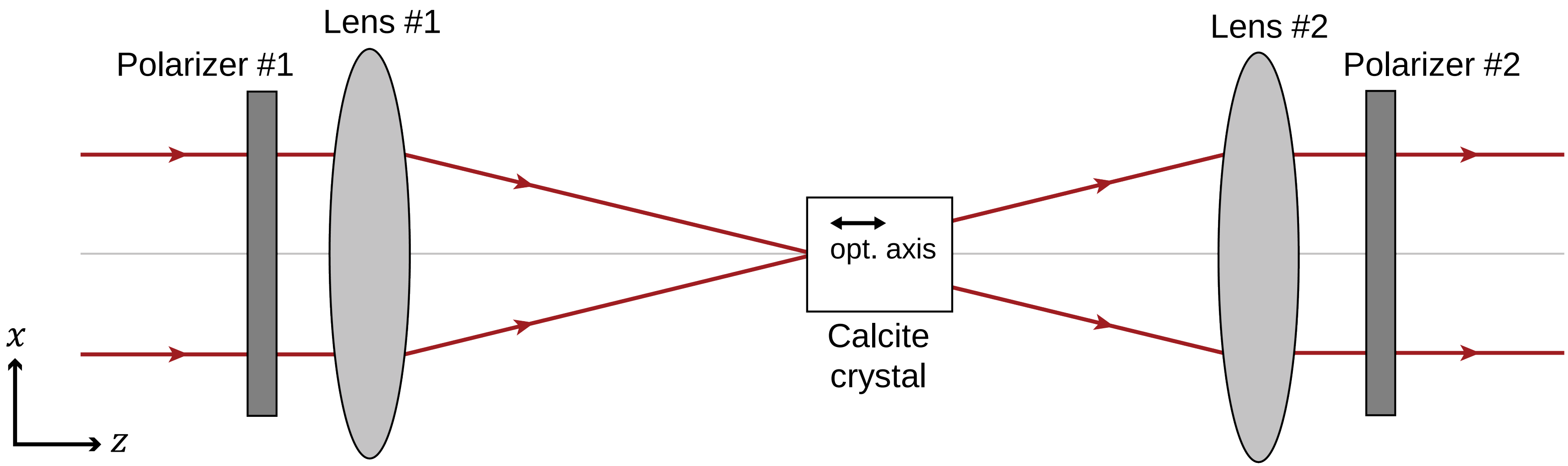
Laser Systems > Crystal Modeling

Polarization Conversion in Uniaxial Crystals

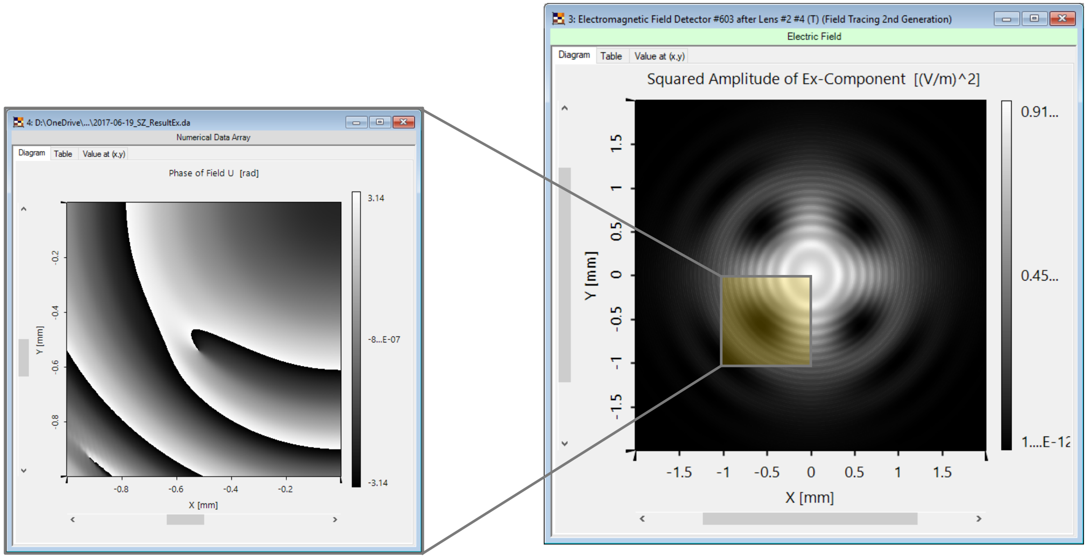
Task/System Illustration



analysis of changes in polarization for a focused laser beam propagating through uniaxial crystals

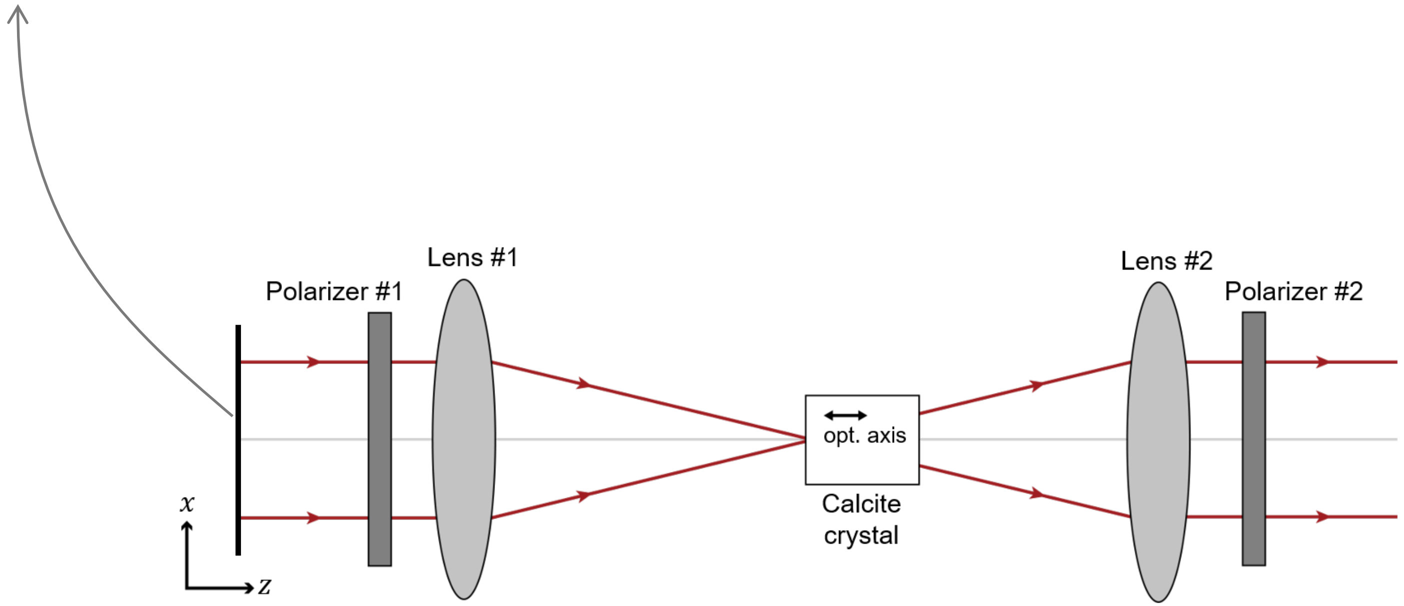
Highlights

- Physical-optics-based simulation includes
  - vectorial effect due to birefrigence,
  - interference.
- Full access to field attributes, includes
  - intensity,
  - phase.



Specification: Light Source

Input laser beam	
wavelength	633 nm
mode	Hermite (0, 0)
waist radius	1.5 mm × 1.5 mm



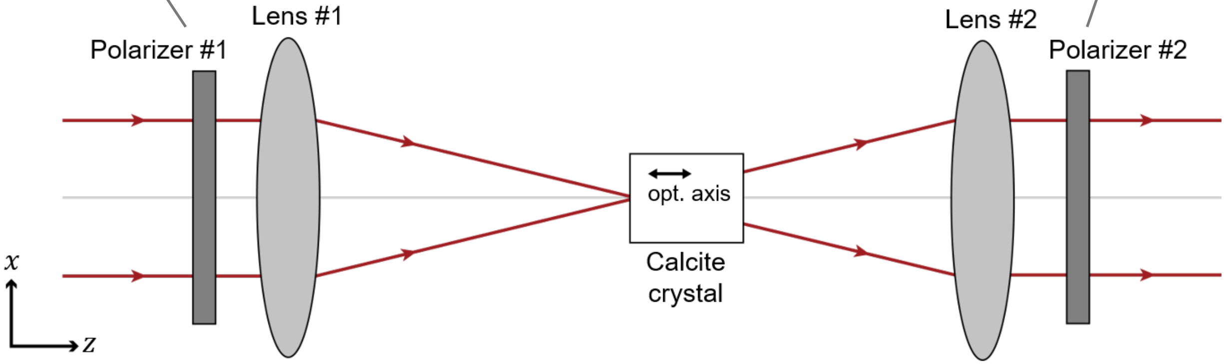
Specification: Polarizers

Polarizer #1	
direction	x-axis

Polarizer #1 generates a linearly polarized laser beam along x-axis

Polarizer #2	
direction	x / y-axis

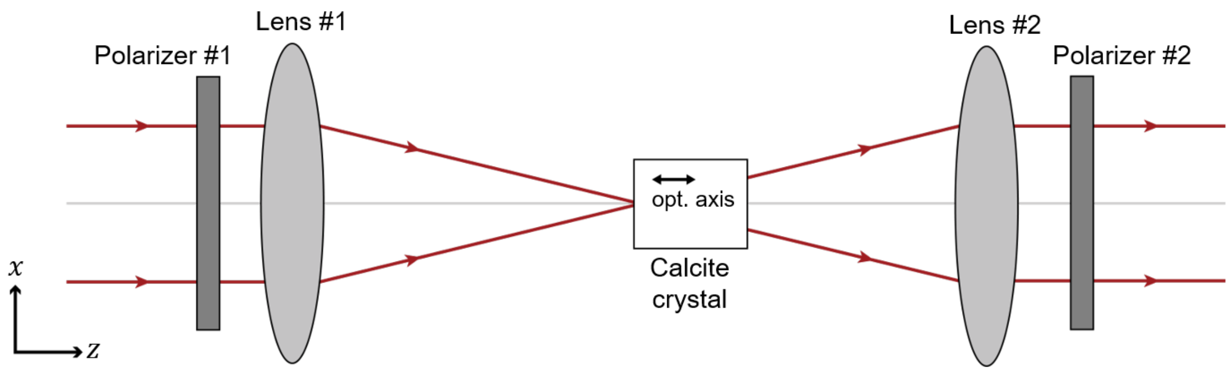
Polarizer #2 is set parallel / orthogonal to #1



Specification: Lenses

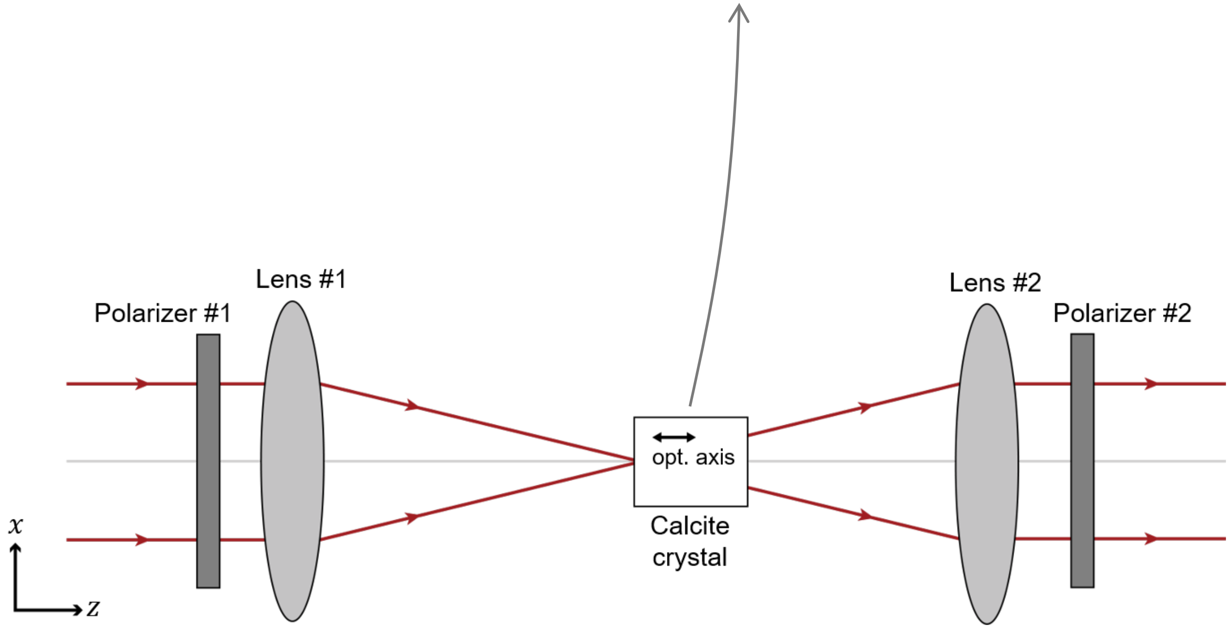
Lens #1	
focal length	30 mm

Lens #2	
focal length	30 mm

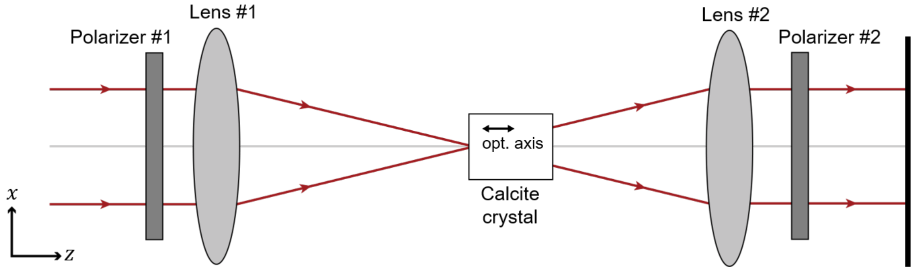


Specification: Crystal

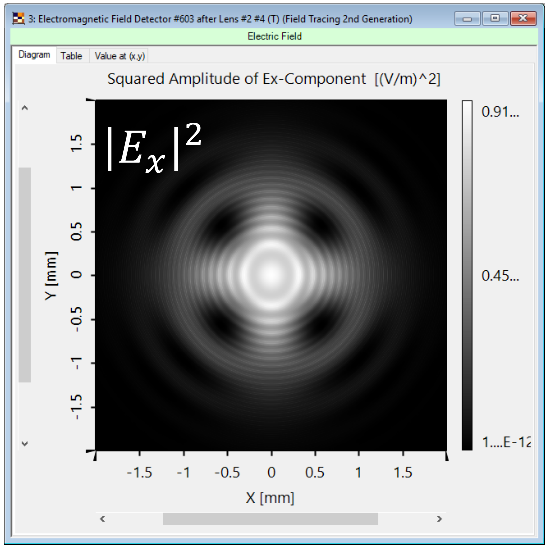
Calcite crystal	
optic axis	along z-axis
refractive indices (@ 633 nm)	$n_o = 1.6558$ $n_e = 1.4852$



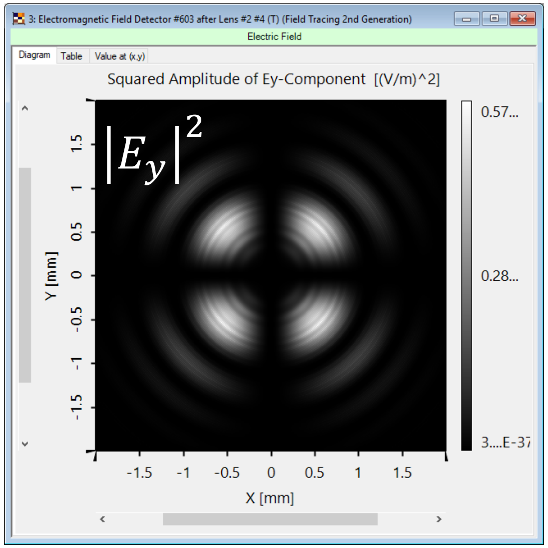
Results



VirtualLab simulation

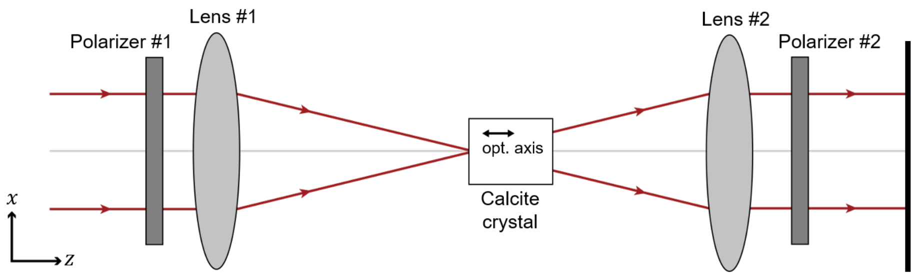


Polarizer #2 along x (#2 ∥ #1)



Polarizer #2 along y (#2 ⊥ #1)

Results: Comparison



VirtualLab simulation

Experimental measurements

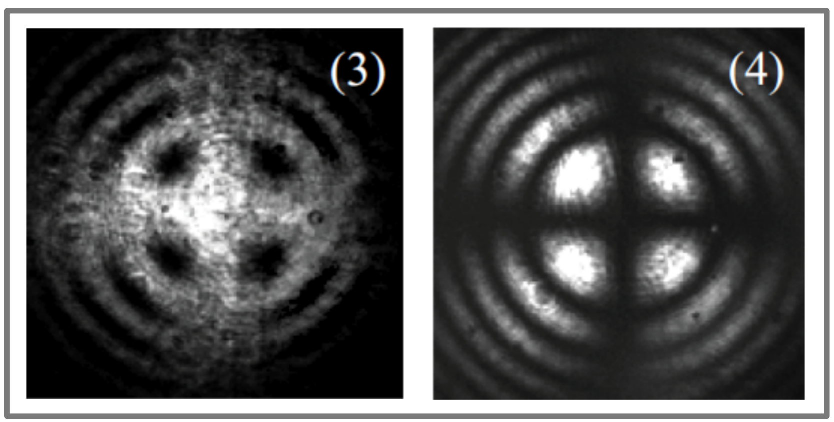
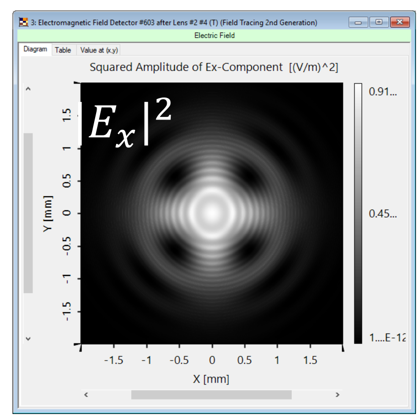
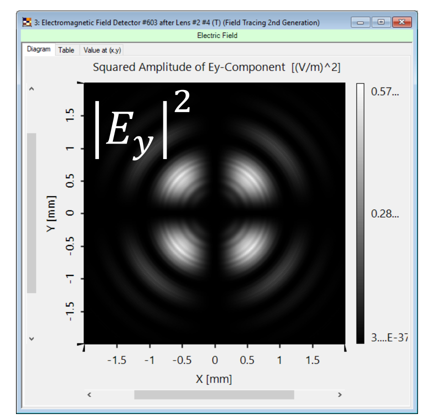


Figure from Y. Izdebskaya *et al.*, Opt. Express **17**, 18196-18208 (2009)

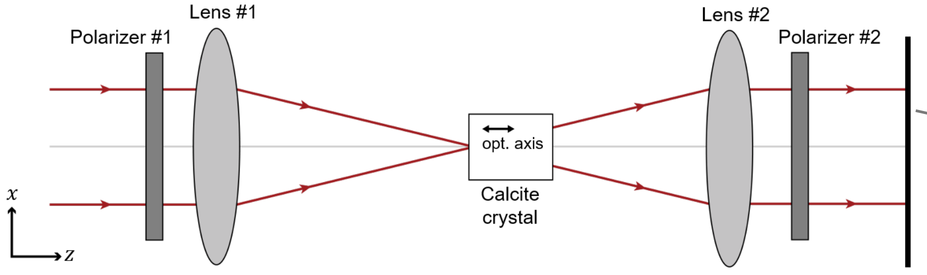


Polarizer #2 along x (#2 ∥ #1)



Polarizer #2 along y (#2 ⊥ #1)

Results: Vectorial



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- Full access to field attributes, including
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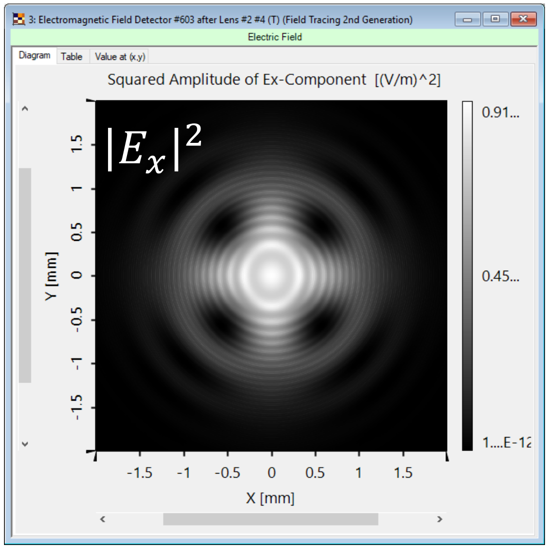

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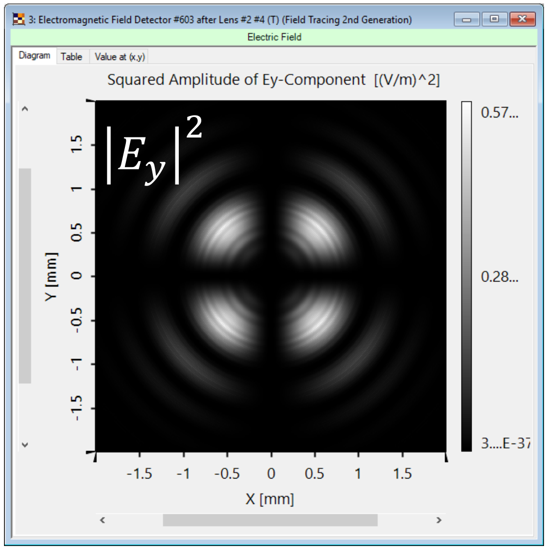
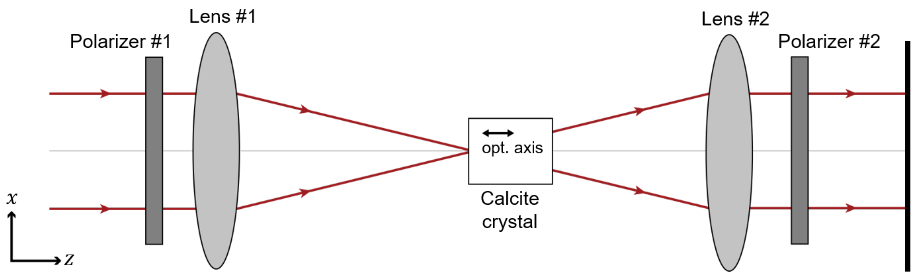


Polarizer #2 along y (#2 ⊥ #1)

Results: Interference



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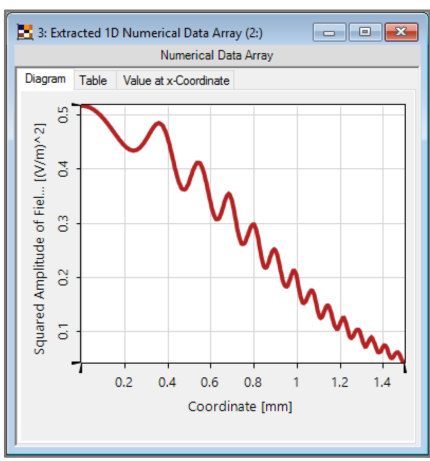
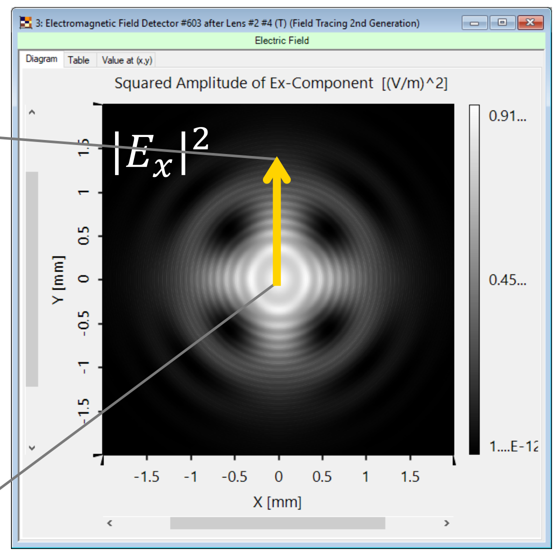
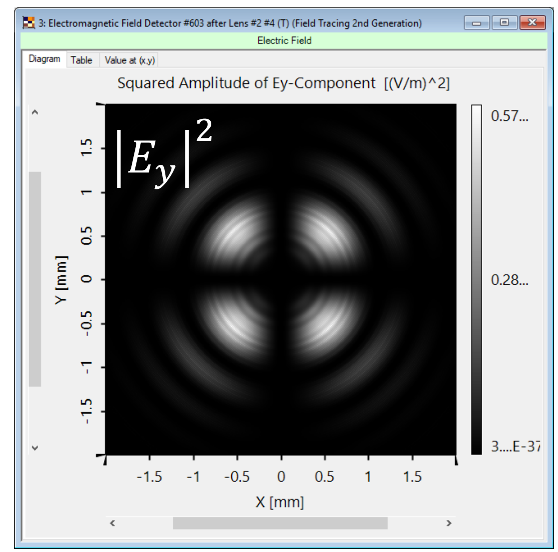


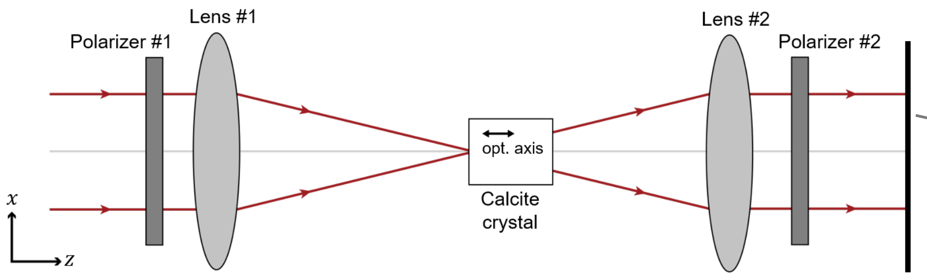


Polarizer #2 along x (#2 ∥ #1)



Polarizer #2 along y (#2 ⊥ #1)

Results: Phase



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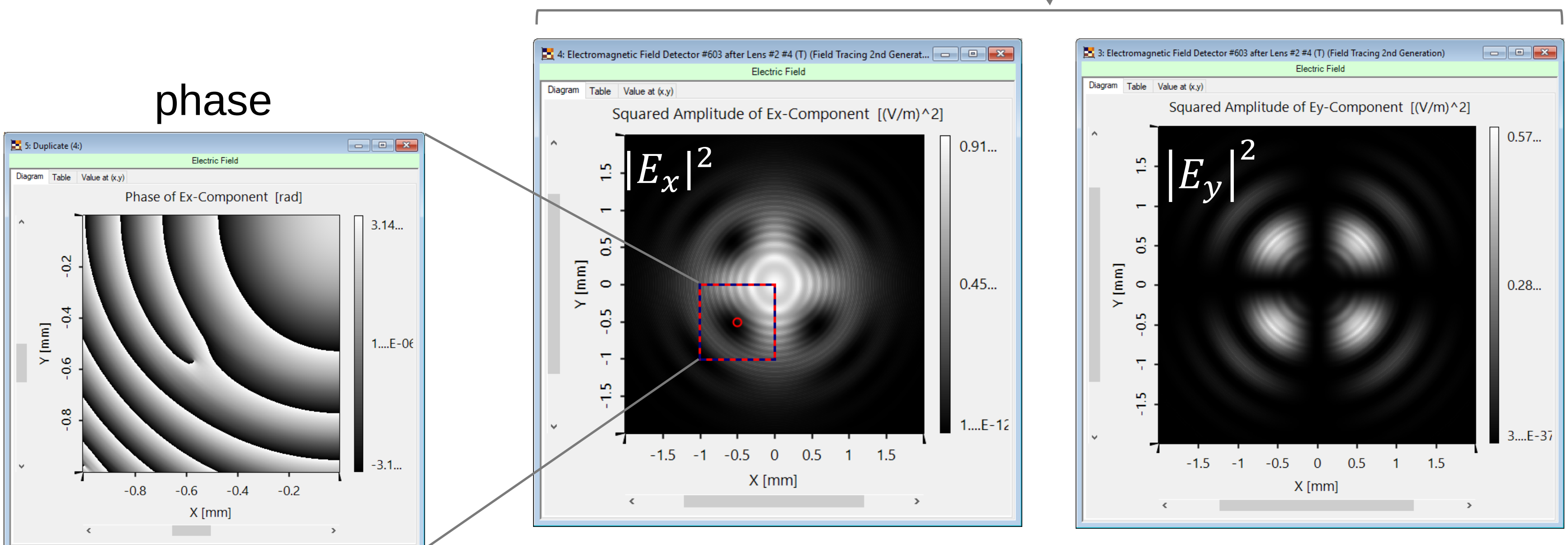
phase



Polarizer #2 along x (#2 ∥ #1)

Polarizer #2 along y (#2 ⊥ #1)

Document & Technical Info

code	CM.0002
version of document	1.0
title	Polarization Conversion in Uniaxial Crystals
category	Laser Systems > Crystal Modeling (CM)
author	Site Zhang (LightTrans)
used VL version	7.0.0.29

Specifications of PC Used for Simulation	
Processor	i7-4910MQ (4 CPU cores)
RAM	32 GB
Operating System	Windows 10