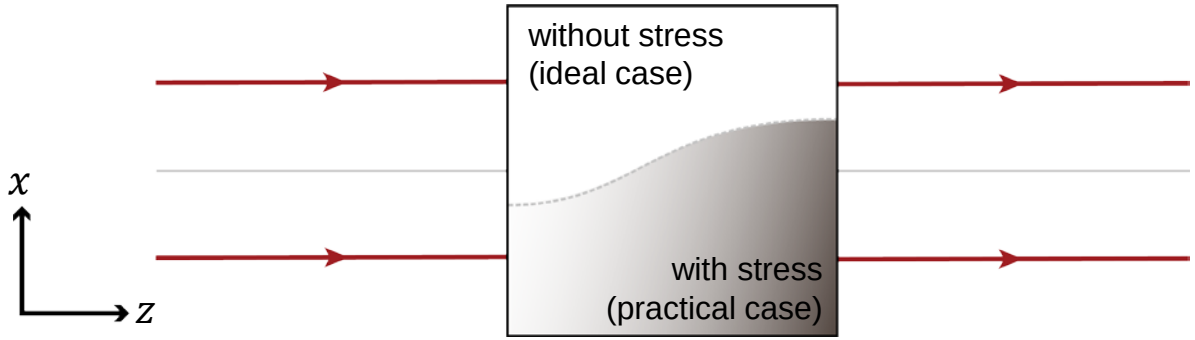
Laser Systems > Crystal Modeling

Stress-induced Birefringence in Laser Crystals

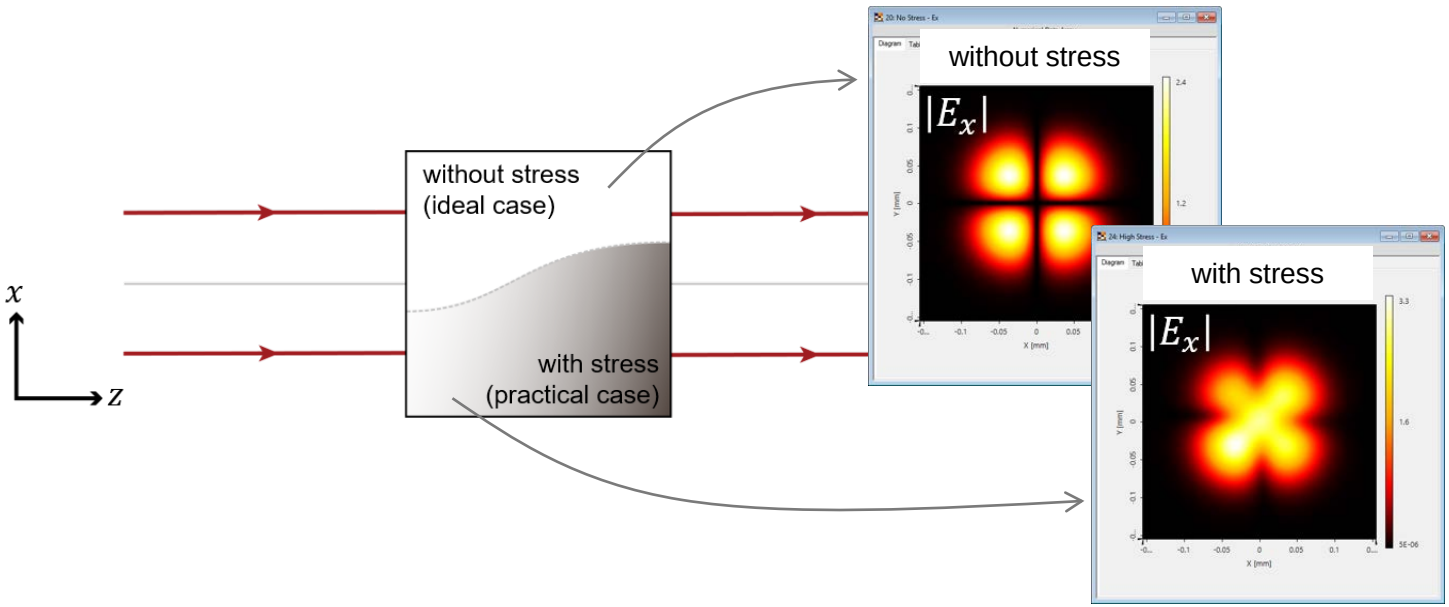
Task/System Illustration



analysis of stress-induced birefringence in laser crystals and its influence on the beam propagating through it, e.g. the change in polarization

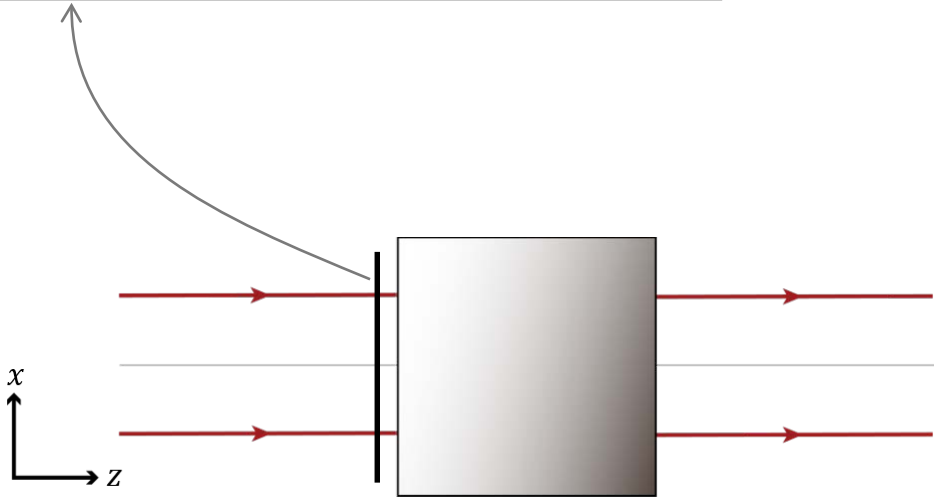
Highlights

- import ANSYS stress analysis result
- inhomogeneity along beam path
- conversion from stress to optical birefringence
- full access to polarization analysis



Specification: Light Source

Input laser beam	
wavelength	532 nm
mode	Hermite (0, 0)
waist radius	50 μm × 50 μm
polarization	linear along y-axis (90°)



Specification: Laser Crystal

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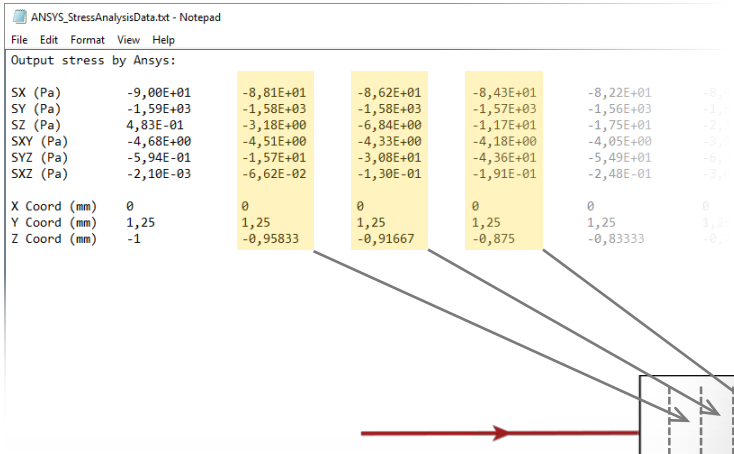

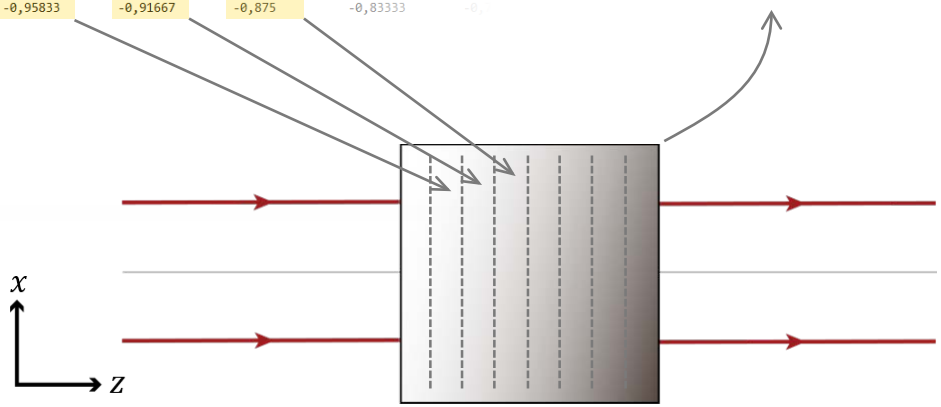

Laser crystal	
crystal type	YAG (isotropic)
base ref. index (@ 532nm)	1.8415
inhomogeneous stress distribution	import from ANSYS (txt format)
photoelastic tensor	6 × 6-matrix form

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$$[\pi'_{mn}]^{\mathrm{m3m}} = \begin{bmatrix} \pi'_{11} & \pi'_{12} & \pi'_{12} & 0 & 0 & 0 \\ \pi'_{12} & \pi'_{11} & \pi'_{12} & 0 & 0 & 0 \\ \pi'_{12} & \pi'_{12} & \pi'_{11} & 0 & 0 & 0 \\ 0 & 0 & 0 & \pi'_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & \pi'_{44} & 0 \\ 0 & 0 & 0 & 0 & 0 & \pi'_{44} \end{bmatrix}$$

Equation from P. Ribes-Pleguezuelo *et al.*, Opt. Express **25**, 5927-5940 (2017)

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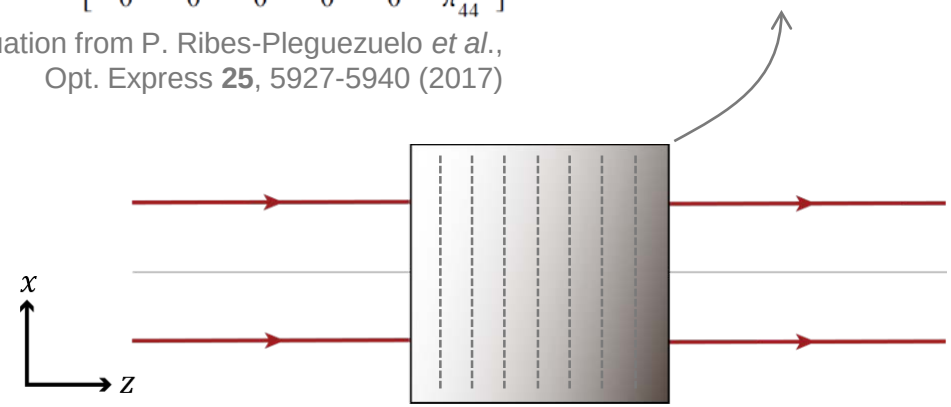
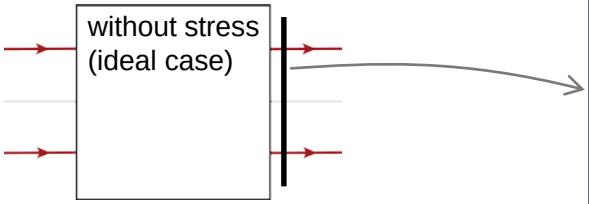
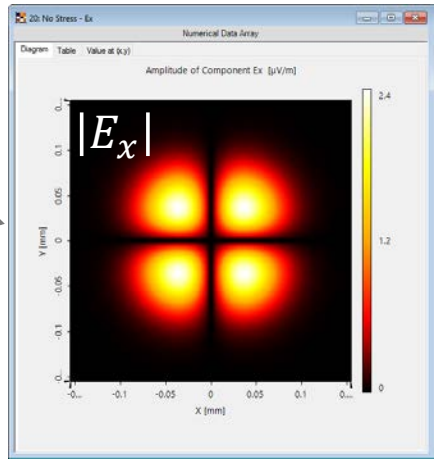
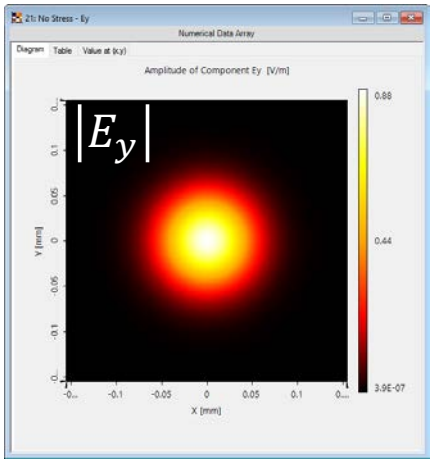
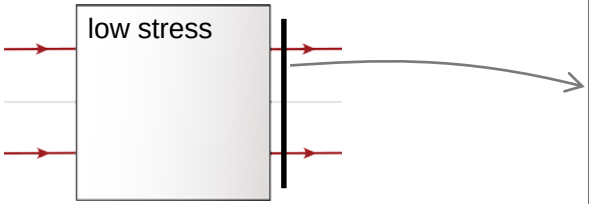


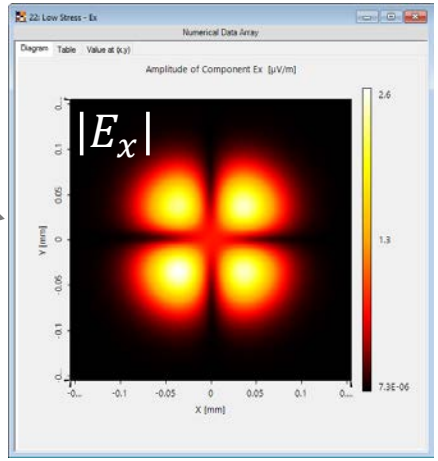
Results: Comparison with Low Stress

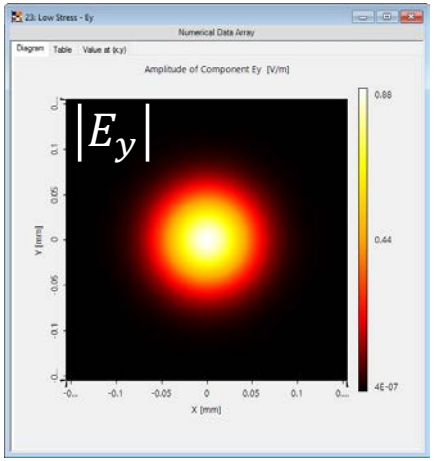




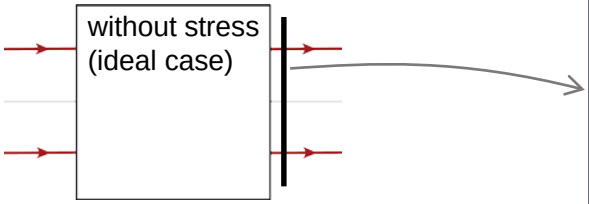


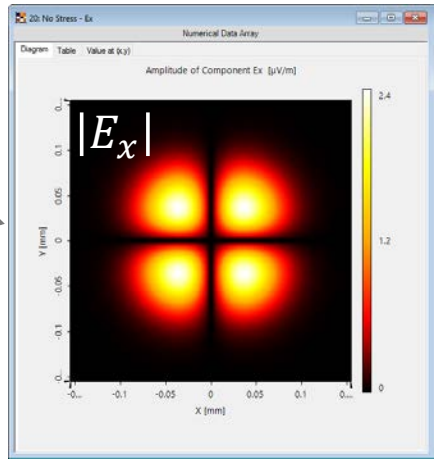


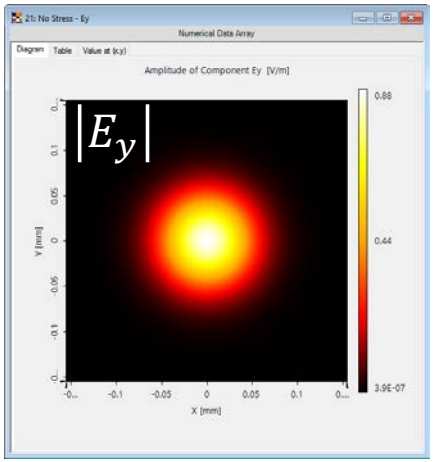


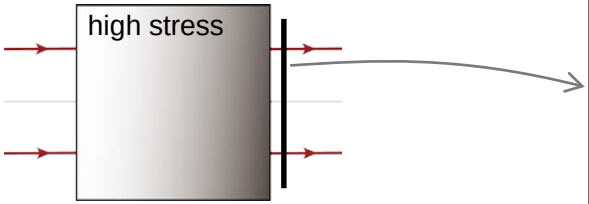


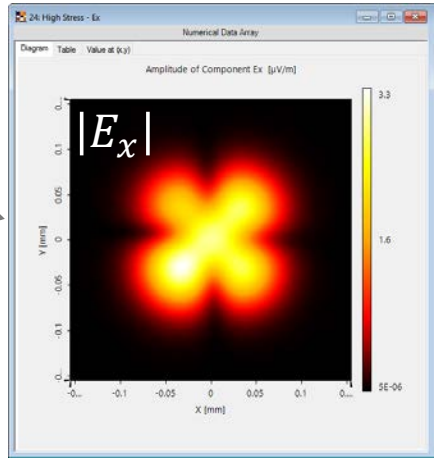
Results: Comparison with High Stress

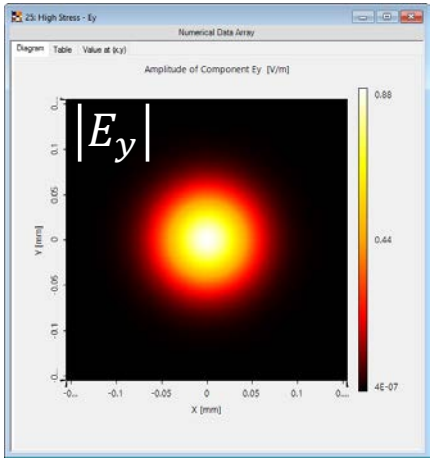




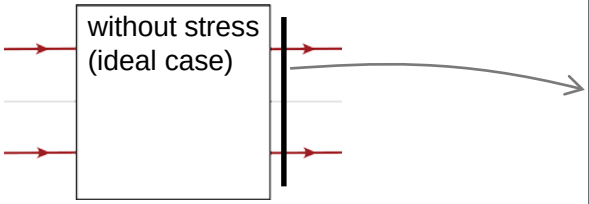


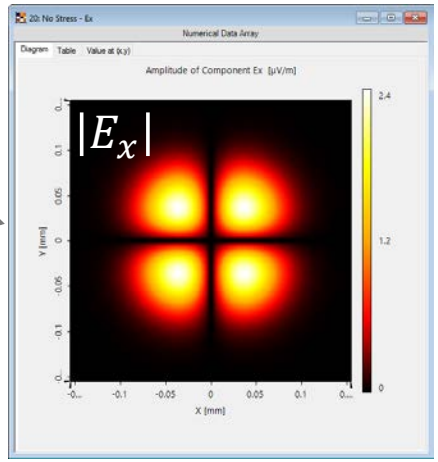


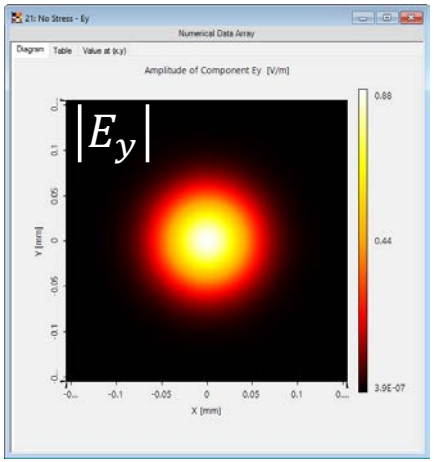


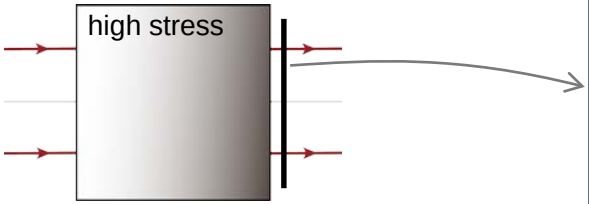


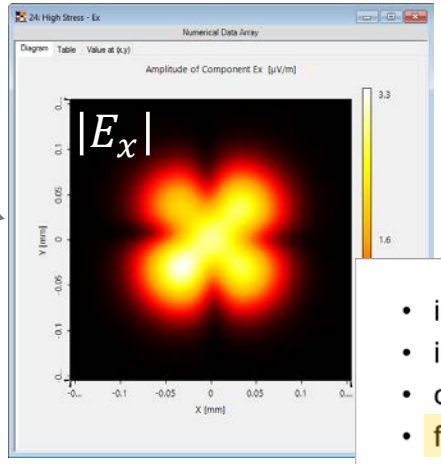
Results

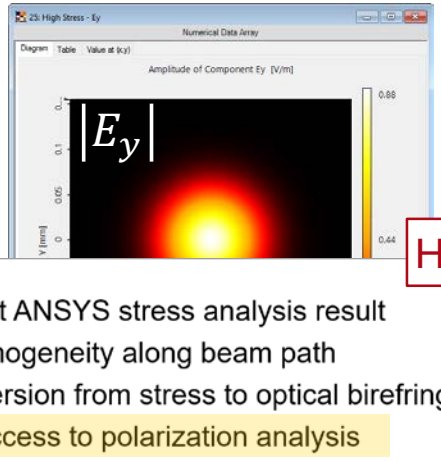












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Document & Technical Info

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