

# Modeling of light propagation through smectic waveguides

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## Motivation

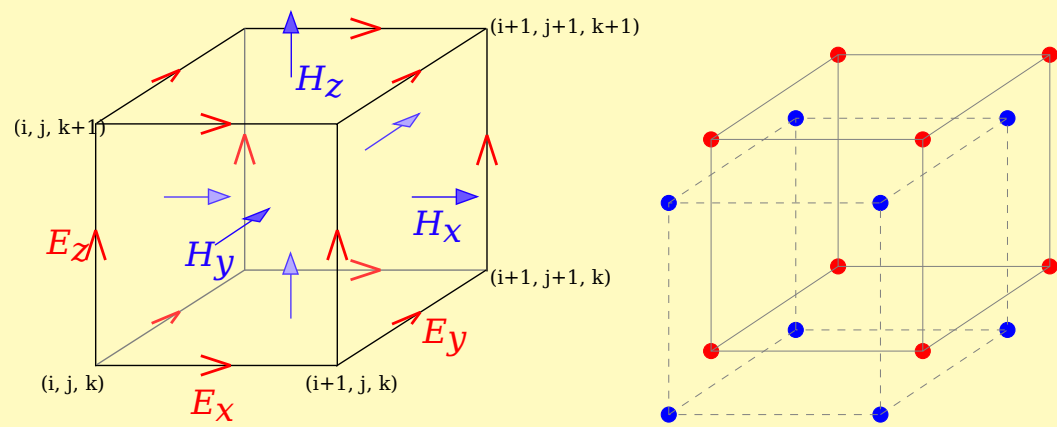
- Light guiding structure play an important role in modern communication systems
- Unique optical properties of liquid crystals make them extremely useful for guiding light
- Smectic fibres with radial director can be created in a laboratory using 8CB and a surfactant[?]
- Point defect in a nematic droplet turns a Gaussian beam into Laguerre-Gaussian – is there a similar effect caused by the line defect in a fibre?

## Results

We showed that a Gaussian beam entering a fibre quickly turns into a Laguerre-Gaussian beam, and then into something else.

## Methods

- FDTD method in 3D with anisotropic  $\varepsilon$
- PBC in  $z$  direction – infinite cylindrical waveguide
- Observe propagation of Gaussian laser pulse
- Staggered grid, adapted for dielectric anisotropy



Left: Yee lattice, optimized for diagonal dielectric tensor.  
Right: The lattice we used, suitable for full anisotropic  $\varepsilon$ .  
In both cases  $\vec{E}$  and  $\vec{H}$  are known at different times

- Cylindrical waveguide with a radial director profile and a singular disclination line along its axis

