Modeling of light propagation through smectic waveguides

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Motivation

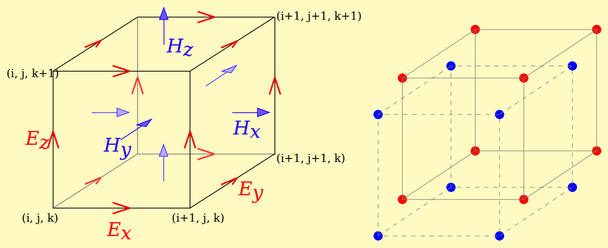
- Light guiding structure play an important role in modern communication systems
- Unique optical properties of liquid crystals make them extremely useful for guiding light
- Smectic fibres with radial director can be created in a laboratory using 8CB and a surfactant[**?**]
- Point defect in a nematic 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 ε
- 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 ε.
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