

# Time-Periodic Waves for Maxwell Equations with Nonlinear Polarization

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The Maxwell equations govern the propagation of electromagnetic waves in matter. In many cases the material properties do not change when an electromagnetic wave propagates through them. However, for a class of materials, the refractive changes in a nonlinear way in the presence of a sufficiently strong electric field  $\mathbf{E}$ .

In this talk I will consider a model for a class of materials with nonlinear polarization properties. I will further consider special geometries where one can prove the existence of propagating time-periodic electromagnetic waves which are localized in directions orthogonal to the propagation direction. This problem leads to a quasilinear hyperbolic nonlinear partial differential equation for the electric field  $\mathbf{E}$ . Solutions with the above properties (localized, time-periodic, propagating) will be found by a variational principle. Numerical simulations will also be shown.

This is joint work with Sebastian Ohrem (KIT).