

# Space-time Finite Element Methods for Maxwell's equations

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We consider Maxwell's equations in a space-time setting and the corresponding variational formulations. In particular we take a look at the vectorial wave equation for the electric field  $E$  including the spatial curl operator. By applying integration by parts in both time and space we derive a Galerkin-Petrov formulation for which we will discuss unique solvability under different assumptions on the given data. Although the numerical discretization in a 4D space-time setting seems to be ambitious at a first glance, it allows for an adaptive resolution simultaneously in time and space and for a parallel implementation. In the end we will consider examples and open problems.

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