Splitting methods for the Schrödinger equation with vector potential

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This talk is about splitting methods for the Schrödinger equation with vector potential

$$i\partial_t u = \frac{1}{2}(i\nabla + A)^2 u + Vu,$$

where u is the quantum mechanical wave function, A the vector potential and V the scalar potential. After imposing the Coulomb gauge, the equation can be split into the kinetic part, the potential part and a pure convection part. For the latter, different semi-Lagrangian methods, based on the method of characteristics, are analyzed and compared, in particular from the point of view of mass conservation.