## Quasi-neutral field formulation of drift-kinetic Vlasov-Maxwell equations

Stefan Possanner<sup>1,2</sup>

<sup>1</sup>Technical University of Munich, Department of Mathematics, Boltzmannstraße 3, 85748 Garching, Germany <sup>2</sup>Max Planck Institute for Plasma Physics, Boltzmannstraße 2, 85748 Garching, Germany

October 13, 2020

## Abstract

We explore the possibilities of deriving a well-posed system of quasi-neutral, driftkinetic Vlasov-Maxwell equations in terms of electromagnetic fields, rather than potentials. Such a model may have several advantages with regards to numerics: 1) built-in conservation of charge, 2) hyperbolic character thus local, 3) no time step restriction due to cyclotron motion and Langmuir waves. We dive into the gyro-center reduction via "variational averaging" and propose to use a previously overlooked degree of freedom - namely the gyro-average of the gauge function - to obtain a wellposed quasi-neutral limit. We argue that the parallel electric field enters the limit model by a suitable choice of the gauge function average.