# A MIXED DG METHOD AND AN HDG METHOD FOR INCOMPRESSIBLE MAGNETOHYDRODYNAMICS

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Abstract. In this talk we present a rencent development on the numerical analysis of a mixed DG method and an HDG method for the stationary Magnetohydrodynamics (MHD) equations with two types of boundary (or constraint) conditions, [2]. The mixed DG method is based on a recent work proposed by Houston et. al. in [1] for the linearized MHD. With two novel discrete Sobolev embedding type estimates for the discontinuous polynomials, we provide a priori error estimates for the method on the nonlinear MHD equations. In the smooth case, we have optimal convergence rate for the velocity, magnetic field and pressure in the energy norm, the Lagrange multiplier only has suboptimal convergence order. With the minimal regularity assumption on the exact solution, the approximation is optimal for all unknowns. To the best of our knowledge, this is the first a priori error estimates of DG methods for the nonlinear MHD equations. In addition, we also propose and analyze the first divergence-free HDG method for the problem with several unique features comparing with the mixed DG method.

**Keywords**: discontinuous Galerkin, Magnetohydrodynamics, local conservation, Hybridization

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## References

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