

## **Matrix-Based Rational Interpolation for New Coupling Scheme Between MHD and Eddy-Current Numerical Models**

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Abstract:

In this article, a matrix-based Padé rational interpolation is used to couple a 3-D eddy-current code with a linear magneto-hydrodynamic (MHD) solver. This approach is a general methodology viable for multiphysics problems involving the coupling of an electromagnetic model with another non algebraic physical model, which has to be solved in a certain region of space. The matrix-based Padé interpolation has been applied to a typical plasma physics problem of modeling the plasma response to external perturbation, providing an accurate and reliable mathematical model viable for the feedback stabilization of resistive wall modes (RWMs) in fusion plasmas. The choice of matrix-based Padé interpolation gives a reliable approach for the considered problem and can be viewed as a convenient formalism for the coupling strategy in this class of multi-physics problems.