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SEMINAR OF NUMERICAL ANALYSIS

➤ **WEDNESDAY 7 DECEMBER 2016 - ROOM MA A1 12 - 16h15**

Dr. Jacopo CORNO (Graduate School CE & Institut für Theorie Elektromagnetischer Felder, TU Darmstadt, Germany) will present a seminar entitled:

“Uncertainty Quantification for Geometry Deformations of Superconducting Cavities”

Abstract:

The representation of the geometrical design of electromagnetic devices such as, for example, energy transducers, magnetrons, waveguides, antennas and linear accelerators is crucial in determining the device performance. In particular, for accelerator cavities, controlling the resonant frequency of the eigenmodes is important in order to guarantee the synchronization of the electromagnetic field and the particle beam which determines the efficiency of the device.

The main interest of this work is the study of linear accelerator superconducting cavities, such as the 9-cell TESLA cavity, and the evaluation of eigenmode sensitivities with respect to geometrical changes. In order to exactly represent the computational domain and its deformation, an Isogeometric Analysis (IGA) approach was chosen. To further reduce the complexity of the simulations we propose two instances of substructuring methods: the first one is a Mortar method that exploits the inherent properties of the IGA basis to naturally define the approximation space for the multipliers; the second one is inspired by the State Space Concatenation (SSC) method recently introduced by Flisgen et al. and has the advantage of exploiting the accelerator structure for the splitting.

The effect of the geometry deformations can be studied using methods from Uncertainty Quantification (e.g. Monte Carlo simulations or stochastic collocation). To ensure consistency of the solution among the various eigenvalue problems and numerical efficiency, an eigenvalue tracking technique is applied based on homotopies between collocation points and a Newton-like eigenvalue solver.

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