

Seminar

Institute for Plasma Research

Title : Application of meshless methods to the computation of fixed boundary equilibria and current-hole simulation in tokamak

Speaker : Dr. Dinesh Nath
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Date : 22nd April 2016 (Friday)

Time : 03.30 PM

Venue : Seminar Hall, IPR

Abstract:

The meshless methods are increasingly being used in the numerical simulations of partial differential equations (PDEs), despite the fact that mesh based methods such as finite difference method (FDM), finite element method (FEM), finite volume method (FVM) and spectral methods are sufficiently developed. One of the difficulties that mesh based methods face is the creation of mesh in various applied and engineering problems. Unlike the FDM, FEM and FVM meshes in which every node has the connectivity to its neighboring nodes, these points in meshless methods have no nodal connectivity and hence can handle complex geometries without much difficulty.

The application of meshless methods to plasmas has so far been very limited. In this work we have developed some of the boundary and domain type meshless methods, that use the fundamental solutions and radial basis functions, for the computation of fixed boundary equilibria in tokamak. The performance of the methods has been tested for the numerical solution of Grad-Shafranov equation (both for linear and nonlinear right hand side cases) with various shapes of tokamak cross sections. We also have developed certain possible meshless formulations of the reduced resistive MHD equations for the time evolution of the plasma and simulated the current-hole problem in a tokamak.
