

数学与系统科学研究院

计算数学所学术报告

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报告题目: Multiscale Discontinuous
Galerkin Time Domain Method for
Electromagnetics

邀请人: 唐贻发研究员

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Abstract:

System-level electromagnetic design problems are multiscale and very challenging to solve. They remain a significant barrier to system design optimization for a foreseeable future. Such multiscale problems often contain three electrical scales, i.e., the fine scale (geometrical feature size much smaller than a wavelength), the coarse scale (geometrical feature size greater than a wavelength), and the intermediate scale between the two extremes. Existing commercial tools are based on single methodologies (such as finite element method or finite-difference time-domain method), and are unable to solve large multiscale problems. For example, no commercial software package is known to be able to model a simple package (say at 0.1 mm resolution) inside a reverberation chamber (1 m) for RF interference testing.

We will present our recent work in solving realistic multiscale system-level EM design simulation problems in time domain. We hybridize the spectral

element time-domain method and finite-element time-domain method together with the perfectly matched layer, with adaptive explicit and implicit time integration schemes for different subdomains. The discontinuous Galerkin method is used as the subdomain interface condition. We further incorporate a nonlinear circuit solver, making it possible to perform nonlinear circuit simulation with RF interactions in a seamless manner. Several challenging multiscale problems will be illustrated.

Biography:

Qing Huo Liu is a Fellow of the IEEE and a Fellow of the Acoustical Society of America. He received the B.S. and M.S. degrees in physics from Xiamen University, China in 1983 and 1986, respectively, and Ph.D. degree in electrical engineering from the University of Illinois at Urbana-Champaign in 1989. His research interests include wave computation and processing in biomedical and subsurface sensing and imaging, design optimization of high-speed electronic packaging and nanodevices. He has published more than 420 papers in these areas in refereed journals

and conference proceedings. He was a Research Scientist and Program Leader with Schlumberger-Doll Research, Ridgefield, CT from 1990 to 1995. From 1996 to 1999 he was a faculty member with New Mexico State University. Since June 1999 he has been with Duke University where he is now a full Professor. Currently he serves as a Deputy Editor-in-Chief of Journal of Electromagnetic Waves and Applications, a Deputy Editor-in-Chief of Progress in Electromagnetic Research, an Associate Editor for IEEE Transactions on Geoscience and Remote Sensing, and an Editor for Journal of Computational Acoustics. He received the 1996 Presidential Early Career Award for Scientists and Engineers (PECASE) from the White House, the 1996 Early Career Research Award from the Environmental Protection Agency, and the 1997 CAREER Award from the National Science Foundation.

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