学 术 报 告

ACADEMIC LECTURE

题目： **Advanced EM Design Using Surrogate Models and Space Mapping**

时间： 2010.06.22, 下午2:00-3:30

地点： 行政楼208会议室

报告人： **Qingsha S. Cheng**

Biography： Qingsha S. Cheng, a professional engineer in the province of Ontario, Canada, and a senior member of the IEEE, was born in China. He received the B.Eng. and M.Eng. degrees from Chongqing University, China, in 1995 and 1998, respectively. He received his Ph.D. at McMaster University, Canada, in 2004. In 1998, he joined the Department of Computer Science and Technology, Peking University, China. In 1999, he joined the Department of Electrical and Computer Engineering, McMaster University. Currently he is a Research Associate in the Department of Electrical and Computer Engineering. He has ten years of experience in the art and science of surrogate modeling and space mapping. His research interests include simulator-based tuning, surrogate modeling, computer-aided design, modeling of microwave circuits, software design technology and methodologies for microwave CAD.

Abstract : Traditional gradient-based optimization algorithms such as Newton-based methods utilize local information and Taylor's formula to create local mathematical models or approximations. However, since electromagnetic (EM) simulation is typically CPU-intensive, even efficient gradient-based algorithms may find full-wave EM optimization of complex structures prohibitive. A more appropriate methodology, space mapping (SM), takes such engineering optimizations to the next level. It utilizes an updated fast physical model (coarse model or surrogate) to approximate the full-wave EM model (fine model). We review the original space mapping (aggressive space mapping), implicit space mapping, input and output space mapping and the state-of-the-art tuning space mapping. Aggressive space mapping iteratively updates the mapping to obtain the next design. Input and output space mapping attach explicit mapping block(s) to the coarse model to form a surrogate. Implicit space mapping utilizes a set of "preassigned parameters" to calibrate the coarse model. Our latest development, tuning space mapping is based on the idea of "simulator-based" tuning. In the tuning space mapping framework, we alter an EM model by embedding suitable tuning elements. The resulting tuning model is aligned with the original unaltered EM model. We then designate the aligned tuning model as surrogate for design optimization purposes. We present a generalized space mapping framework to include all the mapping types. Verification using several microwave design problems is provided.