

16:00 **Electromagnétisme et structures multi-échelles**
Electromagnetism and multiscale structures

Hervé Aubert, LAAS-CNRS, Toulouse



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An efficient monolithic (unique) formulation for the electromagnetic modeling of multiscale structures, i.e., structures that exhibit multiple metallic patterns whose sizes cover a large range of scales, will be presented. Examples of multi-scale structures are given by multi-band frequency-selective surfaces, active or passive reflectarrays, or self-similar (pre-fractal) planar objects. Applying to such complex structures available full-wave electromagnetic simulations requires prohibitive execution time and memory resources. The electromagnetic simulation of multi-scale structures may be performed by the combination or hybridization of various numerical techniques, each technique being the most appropriate for each particular scale level. However such coupling between heterogeneous formulations or the interconnection of various simulation tools is very delicate in practice. In order to overcome these theoretical and practical difficulties, an original monolithic (unique) formulation is proposed here for the electromagnetic modeling of multi-scale structures. This new approach, named the Scale Changing Technique, is based on the cascade of multi-modal Scale Changing Networks, each network modeling the electromagnetic coupling between two successive scale levels. Recent applications of this technique to the design and electromagnetic simulation of active planar phase-shifters, pre-fractal scatterers and multi-frequency selective surfaces will be shown and discussed.

Hervé Aubert was born in Toulouse, France, in July 1966. He received the Eng. Dipl. in July 1989 and the Ph.D. degree in January 1993, both in Electrical Engineering and both from the Institut National Polytechnique (INPT), Toulouse, France. In January 1993 he joined the faculty of INPT and became Professor in February 2001. From April 1997 to March 1998 he was a Visiting Associate Professor at the School of Engineering and Applied Science, University of Pennsylvania (UPenn), Philadelphia, USA, and was a Visiting Scholar at UPenn from June 15, 2004 to July 31, 2004.

From 2001 to 2005, Dr. Aubert was the Associate Chairman of the Electronics Laboratory at Ecole Nationale Supérieure d'Electronique, d'Electrotechnique, d'Informatique, d'Hydraulique et des Télécommunications (ENSEEIH), Toulouse, and additionally, he was the Head of the Electromagnetism Research Group in this Laboratory (2002–2005). He has joined LAAS-CNRS in February 2006.

Dr. Aubert has performed research work on integral-equation and variational methods applied to electromagnetic wave propagation and scattering. Currently his research activities involve the electromagnetic modelling of complex (multi-scale) structures.