<u>**SEMINAR**</u>

Efficient and stable computational modeling for waves and fields - Inverse and direct problems

Speaker: **Dr. Yu Zhong**
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Note: The seminar will be held in English

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In this talk, computational modeling for both inverse and direct problems associated with waves and fields will be discussed. As one knows, inverse problems in handling waves and fields with only measurement data outside the inspection region are usually ill-posed and nonlinear. Trying to tackle them from the perspective of modeling, we have found that there indeed exist proper models with which inversions could be carried out with good efficiency. We will discuss two types of methods here, the qualitative type and the optimization type. The former are mainly tailored for targets with dimensions much smaller than the wavelength, including various MUSIC-type methods, linear sampling method, while the latter for those with dimensions comparable to wavelength, including various subspace-based optimization methods (SOM): improved SOM, twofold SOM (TSOM), FFT-TSOM, new integral equations, and PDE-based SOM.
In the second part of the talk, computational modeling for composite layered materials will be discussed from two angles: the large-scale aspect and the small-scale aspect, by considering them as uni-axially anisotropic layered media and as layered media embedded with periodically-arranged cylindrical fibres.
Fast, yet stable, approaches have been proposed to settle the spectral response and the spatial response, which serve to build inversion solvers with such materials.

- **About the Speaker**

Dr. Yu Zhong was born in Guangdong, China. He received the B.S. and M.S. degrees in electronic engineering from Zhejiang University, Hangzhou, China, in 2003 and 2006, respectively, and the Ph.D. degree in electrical engineering from the National University of Singapore, Singapore, in 2010.
He was a Research Engineer/Fellow with the National University of Singapore, from 2009 to 2013, during which time he was involved in a French-Singaporean MERLION Co-Operative Program. Since 2014, he has been a Scientist with the Institute of High Performance Computing, A*Star, Singapore. He has been invited to the Laboratoire des Signaux et Systèmes, Gif-sur-Yvette, France, as an Invited Scientific Expert once per year from 2010 to 2015. His research interests include numerical methods for inverse scattering problems, waves and fields modeling with complex materials, and nondestructive testing.