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Casimir Force Calculation: A Grand Challenge Problem for Computational Electromagnetics

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Abstract

This talk will begin by introducing quantum effects that are relevant to electromagnetics. A number of technologies are increasingly affected by quantum theory as measurement sensitivity increases and device dimensions become smaller. Examples of such technologies are quantum communication, quantum computing, and quantum sensors. We will briefly review how quantum effects in electromagnetics are impacting the development of quantum technologies.

Then we will focus on the Casimir force calculation. The physics and mathematics of it will be reviewed, and we will explain why this problem can be a grand challenge problem. The argument principle approach will be reviewed, and we will demonstrate how it can be easily used to compute Casimir force.

Biography

Weng C. Chew received all his degrees from MIT. His research interests are in wave physics, specializing in fast algorithms for multiple scattering imaging and computational electromagnetics in the last 30 years. His recent research interest is in combining quantum theory with electromagnetics, and differential geometry with computational electromagnetics. After MIT, he joined Schlumberger-Doll Research in 1981. In 1985, he joined U Illinois Urbana-Champaign, was then the director of the Electromagnetics Lab from 1995-2007.

During 2000-2005, he was the Founder Professor, 2005-2009 the YT Lo Chair Professor, and 2013-2017 the Fisher Distinguished Professor. During 2007-2011, he was the Dean of Engineering at The University of Hong Kong. He joined Purdue U in August 2017 as a Distinguished Professor. He has co-authored three books, many lecture notes, over 400 journal papers, and over 600 conference papers. He is a fellow of various societies, and an ISI highly cited author. In 2000, he received the IEEE Graduate Teaching Award, in 2008, he received the IEEE AP-S CT Tai Distinguished Educator Award, in 2013, elected to the National Academy of Engineering, and in 2015 received the ACES Computational Electromagnetics Award. He received the 2017 IEEE Electromagnetics Award. He now is the 2018 IEEE AP-S President.