

* Thursday, 11th August 2016
10.00 – 11.00 am

Seats are limited! RSVP by 7th August!!

Meeting Room 02, Level 6, 75 Talavera Road (75T 6.02 Meeting Rm)
Macquarie University

Ultra-high Efficiency Phased Arrays for Astronomy, Remote Sensing, and Satellite Communications

For most wireless communication systems, the signal environment is dominated by ambient noise and interference, which means that improving the efficiency of the antenna does not increase performance much. When the signal comes from the sky (think radio astronomy and satellite communications), the situation is very different. High aperture efficiency, radiation efficiency, spill over efficiency, and low noise electronics are everything in terms of the performance of a receiver. Bent metal antennas (horns and parabolic dishes) are very efficient and for the last century have been working just fine. The catch is that these kinds of receivers are “dumb” and offer only a fixed beam pattern. We would like to use smart antennas, phased arrays, and adaptive antennas for astronomy and satellite applications to have more control over the beam and more flexibility in selectively receiving signals of interest, but existing phased array technologies are too expensive, lossy, noisy, and most of all, too inefficient. Over more than a decade, my group has used numerical modelling, antenna design optimization, network theory, microwave noise analysis, and array signal processing theory to produce some of the most sensitive phased arrays ever built. This presentation will tell the story of this research field and show how the results have enabled new sensors, satellite receivers, scientific instruments, and influenced the IEEE’s latest version of the governing standard for definitions of antenna terms.

Karl F. Warnick

*Fellow IEEE, Distinguished Lecturer, IEEE AP Society
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Karl F. Warnick received the B.S. degree and the Ph.D. degree from Brigham Young University (BYU), Provo, UT, in 1994 and 1997, respectively. From 1998 to 2000, he was a Postdoctoral Research Associate at the University of Illinois at Urbana-Champaign. Since 2000, he has been a faculty member in the Department of Electrical and Computer Engineering at BYU, where he is currently a Professor. Dr. Warnick has published many scientific articles and conference papers on electromagnetic theory, numerical methods, remote sensing, antenna applications, phased arrays, biomedical devices, and inverse scattering, and is the author of three books in these areas. Dr. Warnick is a Fellow of the IEEE for contributions to theoretical and numerical analysis of phased-array antennas and microwave systems and is a recipient of an Outstanding Faculty Member award for Electrical and Computer Engineering, the BYU Young Scholar Award, the Ira A. Fulton College of Engineering and Technology Excellence in Scholarship Award, and the BYU Karl G. Maeser Research and Creative Arts Award. He has served the Antennas and Propagation Society as a member and co-chair of the Education Committee and as Senior Associate Editor of the IEEE Transactions on Antennas and Propagation and Antennas.

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