UCONN
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ELECTRICAL & COMPUTER ENGINEERING

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Generating and mapping GHz to THz EM fields

Dr. Daniel van der Weide

High-frequency electric and magnetic fields underlie the operation of antennas, circuits, and devices across communications, sensing, and medical technologies. Yet, visualizing these fields is challenging: they oscillate too quickly to capture directly and vary on spatial scales far smaller than a wavelength. In this talk, I will describe new approaches that make these fields visible and measurable. Scanned near-field probes allow us to trace the fine structure of electric and magnetic field components across an antenna or device. Spin crossover (SCO) materials offer a complementary method, converting absorbed field power into a thermal map that reveals how energy is distributed. Finally, artificial neural networks (ANNs) can reconstruct complete field patterns from only a subset of measurements, reducing the time needed to build up a full picture. By combining these approaches, we can both image and computationally reconstruct fields that were previously hidden, offering new insights into how antennas radiate, how devices interact with waves, and how simulations compare with reality. These advances open new possibilities for design, diagnostics, and discovery in high-frequency electronics and electromagnetics.

Grainger Institute for Engineering Professor of ECE, UW–Madison

Dan van der Weide received his BSEE from the University of Iowa and Ph.D. from Stanford University. He held positions at Lawrence Livermore National Laboratory, Hewlett-Packard, Motorola, and Watkins-Johnson, and was a postdoctoral researcher under Nobel laureate Klaus von Klitzing at the Max Planck Institute. A pioneer in terahertz electronics, he developed record ultrafast circuits and antennas and has applied these technologies to medical devices and diagnostics. He founded NeuWave Medical (acquired by Johnson & Johnson), Elucent Medical, and Optametra (acquired by Tektronix), and cofounded ANTENNEX B.V. in the Netherlands. His current research integrates high-frequency measurement science, machine learning, and bio-inspired materials. He is a Fellow of the IEEE, recipient of the NSF Presidential Early Career Award, ONR Young Investigator Award, and DARPA Ultra Electronics Program Outstanding Achievement Award, and he directs the UW Madison CHIPS Center.

https://vdw.ece.wisc.edu/staff/van-der-weide-dan/