IEEE MTT/AP Orlando Chapter & Raj Mittra Distinguished Lecture Program

"Deployable Reflectarray Antennas for Space Applications"

DATE/TIME: Thursday, April 20, 2017 (5:00 PM-6:00 PM)

SPEAKER: Dr. Thomas Cwik
NASA Jet Propulsion Laboratory, California Institute of Technology

ABSTRACT:

Reflectarray antennas have been developed on Earth and proven in the lab in various configurations. Being planar, they provide an especially compact reflector antenna system for a range of communication and remote-sensing applications. They are now being developed for space application, especially drive by small satellites where volume is at a premium. For apertures that will be larger than the spacecraft bus dimensions and hence must be deployed, both the deployed precision for the frequency of operation, as well as stowed volume during launch, are driving parameters.

The reflectarray antenna is a natural choice since the panels are held against the side of the spacecraft bus during launch and deployed in a hinged system on-orbit. The flat, two-dimensional reflectarray antenna geometry negates the additional volume needed for deployed parabolic or other conic three-dimensional surfaces of the traditional aperture antenna. The reflectarray panels can be fabricated to meet on-orbit thermal demands and launch dynamic requirements, providing the necessary deployed precision when coupled with appropriate hinges connecting the panels. A release mechanism allows the panels to deploy on orbit. A first application of this approach integrated solar cells with the reflectarray antenna (ISARA) operating at Ka-band, combining the two functions and resulting in small additional mass and volume increase over the solar panels themselves. Follow-on applications have been developed for an upcoming Mars mission where the reflectarray antennas are used for telecommunications in the entry, descent and landing portion of the mission. We will present the flight development of these systems, their application and extended development that attempts to ascertain how large of a reflectarray antenna can be built to deploy from a shoebox sized spacecraft.

BIOGRAPHY:

Dr. Tom Cwik leads the space technology development at NASA's Jet Propulsion Laboratory, as well as leading tech development for the exploration of ocean worlds. He was formerly Associate Chief Technologist at JPL. He received his bachelor's, master's and doctorate in electrical engineering from the University of Illinois, Urbana-Champaign. He joined JPL in 1988 working in a range of advanced engineering and project activities including antenna design, instrument development and high-performance computing focused on high-fidelity modeling of instrument and electromagnetic systems.

Previous positions included leading the JPL Earth Science Instruments & Technology Office. He led proposal development of the Earth observing mission Aquarius/SAC-D NASA Earth System Pathfinder mission to measure sea surface salinity. Tom has supervised the High Performance Computing Group at JPL and has worked in engineering positions across a range of tasks and projects starting with the Cassini Mission, and including work in the Deep Space Network, and a long-term funded effort from the Special Projects Office of the Air Force that originated the field of large-scale parallel computing in computational electromagnetics and design.

Tom is an IEEE Fellow, an Associate Fellow of the AIAA, a Principal Member at JPL and an Affiliate Professor at the University of Washington, Department of Electrical Engineering, Seattle WA. He was named a 2012 Distinguished Alumni of the University of Illinois, ECE Department, Urbana, IL. He has written 8 book chapters and over 30 refereed journal papers. He holds two U.S. patents. He has consulted with industry and has been co-founder and part of start-up companies in a variety of fields.

LOCATION: **University of Central Florida**
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