

**THURSDAY
NOVEMBER 2, 2006**

**Scaife Hall Auditorium
Room 125**

4:30 p.m.
Refreshments—4:00 p.m.

DAVE RUTLEDGE

**TOMIYASU PROFESSOR,
ELECTRICAL ENGINEERING, CALTECH**



Professor Rutledge is the Tomiyasu Professor of Electrical Engineering at Caltech and Chair of the Division of Engineering and Applied Science. His research has been in integrated-circuit antennas, active quasi-optics, computer-aided design, and high-efficiency power amplifiers. He has won the Microwave Prize, the Distinguished Educator Award of the Microwave Theory and Techniques Society, the Teaching Award of the Associated Students of Caltech. He is the author of the electronics textbook, *The Electronics of Radio*, published by Cambridge University Press, and co-author of the microwave computer-aided-design software package, *Puff*, which has sold 30,000 copies.

Stability of Switching Power Amplifiers

I will discuss results in my research group on high-power transmitters. We have been investigating single-chip grid amplifiers that use spatial power combining. This approach has been developed by the Wavestream Corporation to build a single-chip grid amplifier with an output of 20W at 30GHz. This chip has applications for satellite uplinks. In collaboration with Professor Ali Hajimiri at Caltech, we have developed a power-combining technique that is based on a distributed active transformer, together with new high-efficiency switching amplifiers. We have demonstrated an 8-transistor amplifier with an output of 2.7kW at 30MHz with 85% efficiency, and Professor Hajimiri's group has used this approach to set power records for CMOS integrated-circuit power amplifiers. More recently, we have become interested in understanding instabilities in high-efficiency switching power amplifiers. Even though these amplifiers are stable when there is no drive, they exhibit a surprising variety of unstable behaviors when they are driven, including non-commensurate oscillations, locked sub-harmonics, hysteresis, jumps in the input/output power curve, chaos, and noisy precursors. In collaboration with Professor Almudena Suarez of the University of Cantabria, Spain, we have developed new techniques for predicting and eliminating these instabilities.

ECE Seminar Hosts:
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