MTT-S Rump Sessions

RSA: High-Tc Superconductivity Applications

Date: June 2, 1992

Time: 7:30 p.m.–10:30 p.m.

Location: Ruidoso Room—Convention Center

Sponsors: MTT-6 Microwave and Millimeter-Wave Integrated Circuits
MTT-14 Microwave Low Noise Techniques
MTT-16 Microwave Systems
MTT-18 Microwave Superconductivity

Organizers: K.K. Agarwal
M. Nisenoff

Panelists: Martin Nisenoff, Naval Research Labs
Klaus D. Breuer, AIL Systems, Inc.
Cheng Chih Yang, TRW-ESG (Cryogenic Electronics)
Jesse J. Taub, AIL Systems, Inc.
Krishna K. Agarwal, E-Systems, Inc.

Abstract:

Five years have elapsed and some 20,000 papers have been published since the discovery of High Tc superconducting materials. In this short span, significant improvements have been reported in materials, processing, and film characteristics. This is evident from the many papers published on microwave HTSC components with extraordinary performance. For example, thin-film HTSC microwave resonators with Os of 700,000 (versus 200–400 for microstrip gold resonators) at X-band have been reported. This translates into ultra-low noise oscillators, low loss compact filters and channelizers with extremely sharp rejection band, wideband low loss dense delay lines with 20 50 nsec delay, etc. etc. These and many other system building blocks are funded by DARPA, NASA, SDIO, and NRL for applications in future systems.

This rump session would discuss HTSC applications in space satellites, EW, and other ground and air based systems. Performance of MMICs and CMOS circuits at 77K shall be included as well as potential insertion impact of HTSC subsystem blocks and functions in todays semiconductor based systems.

Does HTSC make economic sense? Can the systems bear the added size and weight of coolers? Can the programs withstand the cost? Is the technology mature and reliable enough for system insertion or are we engineers being drawn into a hype from the research labs? Come join in the discussion of these issues. Bring along a viewgraph or two to express your opinion or ask questions.

Rump Sessions

RSB: Are all FET Noise Models Equal, or . . . ?

Date: June 2, 1992

Time: 7:30 p.m.–10:30 p.m.

Location: San Miguel Room—Convention Center

Sponsors: MTT-14 Microwave Low Noise Techniques

Co-Organizers: Dr. Jitendra Goel, TRW
Dr. Madhu Gupta, Hughes
Marian Pospieszalski, IMS '92 Technical Program Committee

Panelists: M. Gupta, Hughes
R. Pucel, Raytheon
A. Cappy, Universitie de Lille, France
M. W. Pospieszalski, NRAO
R. Lane, California Eastern Labs
B. Hughes, HP

Abstract:

A critical review of different FET (HPET) noise models and their meaning for device design, measurement and characterization. The following topics and others from the floor will be discussed:

-A comparative review of different noise models 1975–1991.
-A physical meaning (or lack thereof) of noise model constants (fitting factors)
-Device physics and noise models: how good a connection?
-Dependence of noise model parameters on ambient temperature.
-Are some representations of two-part noise better for a FET than others?
-1/f noise and a FET noise model

Rump Sessions

RSC: Heterojunction Bipolar Transistor Reliability

Date: June 2, 1992

Time: 7:30 p.m.–10:30 p.m.

Location: Cimmaron Room—Convention Center

Sponsors: MTT-6 Microwave & Millimeter-Wave Integrated Circuits
MTT-7 Microwave & Millimeter-Wave Solid State Devices

Organizers: Derry Hornbuckle, HP
Fazal Ali, University of California, Berkeley
John Kuno, Hughes Aircraft

Panelists: Frank Chang, Rockwell International
Madjid Hafizid, Hughes Research Labs
Mark Hueschen, HP
Aaron Oki, TRW
Mike Sanna, Texas Instruments
P. Topham, GEC-Marconi

Abstract:

Heterojunction bipolar transistors (HBTs) are emerging as a key technology for precision analog/digital circuits, low phase-noise oscillators, power amplifiers, frequency dividers, and GHz-rate digital ICs. Compared to FETs, HBTs differ in a number of ways, including:

Precision turn-on voltage, needed for analog/digital circuits
Much lower 1/f noise
Fewer anomalous effects (sidegating, trap-related transients..)
Higher power density (a mixed blessing)
Relaxed lithography requirements for similar cutoff frequency.

HBTs are being considered for a number of system applications because of these advantages, along with excellent device performance, and the ability to use proven silicon design techniques.

However, reliability of HBTs is yet to be proven. GaAs-based HBTs operate at substantially higher temperatures than silicon bipolars. Doping and composition changes over very short vertical dimensions are integral to the device design. And HBTs depend on minority carrier flow, which might mean susceptibility to different failure mechanisms than majority-carrier GaAs FET devices. Experimentally, several reliability issues have been identified, including beta drift and Vbe drift.

This panel session will cover current knowledge of HBT reliability, and implications for systems applications. Audience participation is invited. The emphasis will be on AlGaAs/GaAs devices, but information on InP-based and Si-Ge HBTs is welcomed as well.