



## BUENAVENTURA ELECTRON DEVICES / CIRCUITS AND SYSTEMS SOCIETIES CHAPTER

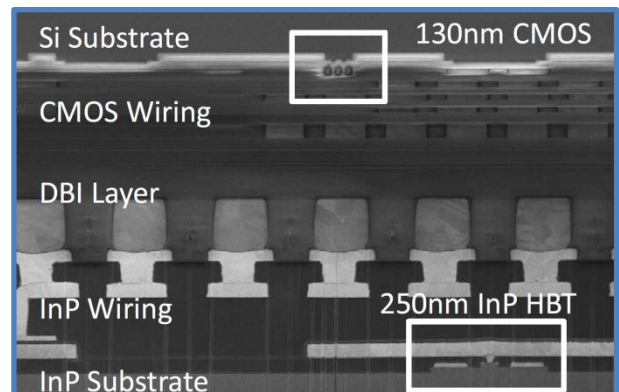
# THz Bandwidth InP HBT Technologies and Heterogeneous Integration with Si CMOS

*Speaker: Dr. Miguel Urteaga*  
Teledyne Scientific

**November 29, 2016 at 6:30 PM**

Location: Skyworks Solutions, Newbury Park, CA

Indium phosphide (InP) transistor technologies have demonstrated bandwidths ( $f_{max}$ ) exceeding 1 THz and are extending integrated circuit operation into the THz frequency regime (0.3 - 3.0 THz). This talk will describe Teledyne Scientific Company's InP heterojunction bipolar transistor (HBT) IC technologies and accompanying circuit demonstrations. These demonstrations include: sophisticated THz monolithic integrated circuits (TMICs) operating at >600GHz, 200 GHz power amplifiers demonstrating record levels of output power (>200 mW) and high-efficiency, and ultra-low power transceiver components at mm-wave frequencies. The functionality of HBT technologies can be extended through integration with other transistor technologies. We have demonstrated an InP BiFET technology that incorporates both high-bandwidth InP HBTs and high-electron mobility transistors (HEMTs) on a common InP substrate. The BiFET technology has further been integrated with a commercial 130 nm Si CMOS process using 3D wafer stacking. The integration is performed using Ziptronix Direct Bond Interconnect (DBI®) process, a room-temperature hybrid bonding process with embedded Cu-based interconnects (5 micron pitch). 3D stacking can be a key enabler for space-constrained systems such as mm-wave phased arrays with  $\lambda/2$ -element spacing, whose performance can benefit from high-performance InP devices.



**Dr. Miguel Urteaga** received his M.S. and Ph.D. degrees in Electrical Engineering from the University of California Santa Barbara in 2001 and 2003, respectively. He is the manager of Teledyne Scientific Company's advanced device development group. His research is focused on the development of ultra-high speed transistor technologies, primarily in the InP material system. He has led the development of Teledyne's high performance InP HBT IC technologies. These technologies have been used to demonstrate state-of-the-art integrated circuits ranging from high speed mixed-signal and digital ICs to mm-wave and THz monolithic integrated circuits. He is currently the program manager at Teledyne for the DARPA THz Electronics and Diverse Accessible Heterogeneous Integration (DAHI) programs. He has authored or co-authored over 70 conference and journal publications.



# Location

Skyworks Solutions

649 Lawrence Drive, Newbury Park, CA 91320

Intersection of West Hillcrest Drive and Lawrence Drive

(NOT the main building, please use link below to arrow that pinpoints building)

<http://maps.google.com/maps?q=34.187542,-118.930994&num=1&t=h&vpsrc=0&ie=UTF8&z=18&iwloc=A>

# Directions

## From Los Angeles

Highway 101 North

Take exit 47A for Rancho Conejo Blvd

Use the left lane to turn right onto Rancho Conejo Blvd

Turn left onto W Hillcrest Dr.

Destination will be on the right

## From Ventura

Highway 101 South

Take exit 47B for Wendy Dr. toward Newbury Park

Turn right onto N Wendy Drive

Continue onto Camino Dos Rios

Turn right onto W Hillcrest Drive

Destination will be on the left.

