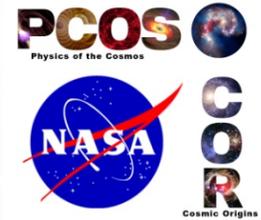


Heterodyne Technology for SOFIA



PI: Dr. Paul Goldsmith/JPL



Description and Objectives:

- Heterodyne technology is necessary to answer fundamental questions including - How do stars form? How do circumstellar disks evolve and form planetary systems? What are the flows of matter and energy in the circumgalactic medium? And what controls the mass-energy-chemical cycles within galaxies?
- We will develop local oscillator (LO) and receiver subsystems that will allow for the implementation of multi-pixel high spectral resolution imaging in the all important 1.9-2.06 THz range.
- Lack of solid-state sources in the THz range is perhaps the single most important challenge towards implementing array receivers
- Lack of broad IF band Hot Electron Mixers is issue at higher freqs:

Key Challenge/Innovation:

Approach:

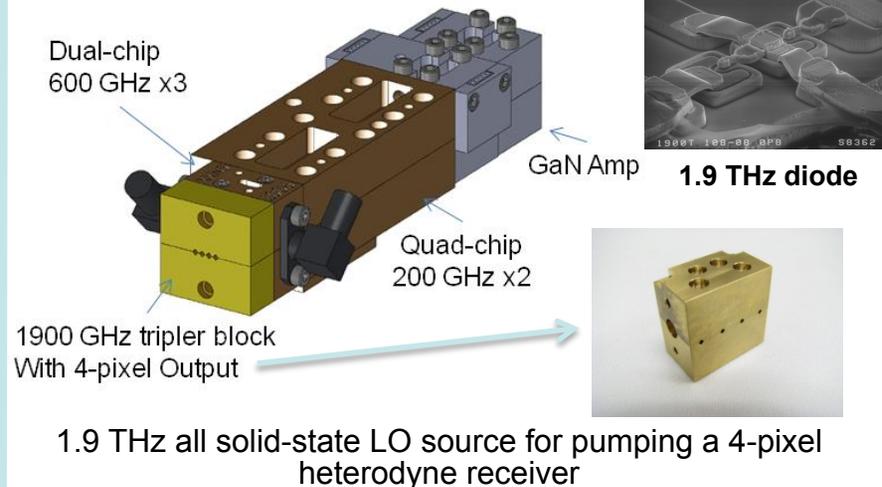
- Utilize JPL developed membrane diode process to construct compact tunable sources in the 1.9-2.06 range
- Utilize novel waveguide based active device power combining schemes to enhance power at these frequencies
- Work with collaborators in Russia to demonstrate wide IF band Hot Electron Mixers
- Build and test multi-pixel receivers to investigate stability and demonstrate performance

Key Collaborators:

- Imran Mehdi, Jon Kawamura, Jeff Stern, Boris Karasik, Jose Siles, Choonsup Lee, Robert Lin (all JPL)

Development Period:

- Oct 2010 – Sept 2013 (no cost extension intended)



Accomplishments and Next Milestones:

- Demonstrated solid-state LO source at 1.904 THz that puts out 50 microwatts of power
- Demonstrated a biasable 1.9 THz LO source
- Demonstrated a 2.7 THz receiver with SOA performance
- Demonstration of 4-pixel LO chain (FY13)
- Development of waveguide based 4-pixel HEB mixer array (FY13)
- Demonstration of 4-pixel array receiver (FY14)
- Final design of 16-pixel array receiver (FY14)

Application:

- Array receivers for SOFIA
- Heterodyne array receivers for future suborbital and space missions
- Array receivers for CCAT

TRLin = 3 TRLcurrent = 3 TRLtarget = 4