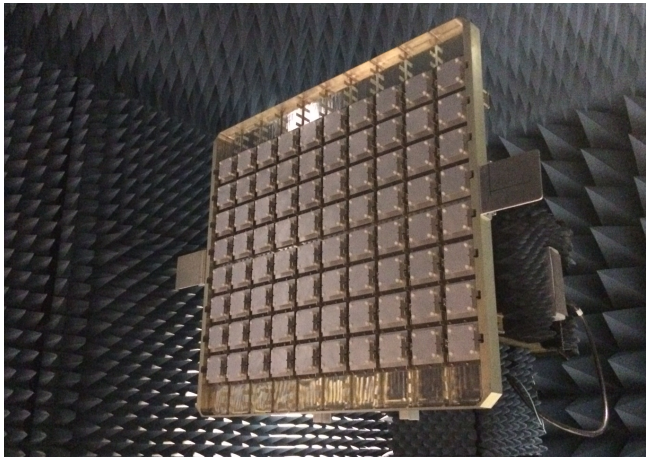
Advanced Antenna for Digital Beamforming SAR

PI: Rafael Rincón, NASA GSFC

Objective

- Develop a Digital Beamforming Synthetic Aperture Radar (DBSAR-2) instrument based on a novel approach that will enable higher resolution imaging with:
  - Wideband (500 MHz) L-band phased-array antenna (State-of-the-Art (SOA) has 80 MHz bandwidth)
  - Slant range resolution of 0.75 m (SOA is 1.88 m)
  - Fully polarimetric measurements
  - Cross-polarization isolation better than –40 dB (SOA is -20 dB)
- Enable accurate characterization of permafrost change and above ground biomass
- Enable GNSS-R and passive L-band measurements



DBSAR's L-band phased-array antenna will enable meter-resolution and fully polarimetric measurements of permafrost and biomass

Accomplishments

- Designed, simulated, fabricated and tested:
  - Single antenna array element that met 500 MHz bandwidth and > 35 dB polarization isolation requirements
  - 8-element subarray that validated simulations
  - 8-element feedboards that met sidelobe, weight, size requirements
  - Prototype radome (48" x 12" x 1.04")
  - Full size radome (53.24" x 46.24" x 1.04")
- Designed, simulated, and fabricated full size antenna array (10x8) including all supporting parts (patches, chassis, etc.)
- Assembled, tested, and validated requirements of antenna in anechoic chamber (measured): Bandwidth 550 MHz; Array Scanning ± 35°; Sidelobe level 18 dB; Cross-polarization isolation 40 dB

Co-Is/Partners: Victor Marrero, Nelis DuToit, Manohar Deshpande, Jon Ranson, GSFC

$TRL_{in} = 2$ $TRL_{out} = 5$