Flexible Antennas and Electronics for L-Band Remote Sensing

Electronically steerable L-band, phased array antennas are needed for missions to the Moon, Mars, Titan, Europa and Venus for remote sensing applications and support of communications. Flexible, lightweight active arrays enable better packaging efficiency for the antenna and are critical for these missions. These antennas will be deployed on orbiting spacecraft and on rovers or aerial platforms such as lighter than atmospheres (LTA) vehicles or airplanes.

When used for active remote sensing, L-band also provides the capability to detect surface and subsurface topology including density contrasts within the ice or dust and subsurface water or warm ice. In addition, the use of L band frequencies enables proximity communications between the in situ vehicle and a spacecraft in orbit or on a flyby trajectory.

Currently, manufacturing reliable passive arrays with required tolerances is challenging and the only method for integration of the electronics is to attach and interconnect the electronic components on the surface. This method is expensive, unreliable, and impractical for large arrays. Technologies enabling large area flexible antennas, including flexible electronics, are needed. State-of-the-art, flexible, printable electronics have low switching frequencies. Innovative new materials or processes will be needed to enable devices that can handle the gigahertz frequencies needed for radar. In addition, large area manufacturing methods are needed to manufacture these passive and active antennas.