

## PASEO – An integrated Radiometer and Spectrometer for Improved Planetary Science

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**Abstract**—A submillimeter wavelength dual-polarization sideband separating receiver is being developed to significantly improve the measurement capabilities of future planetary missions. The Planetary Atmosphere and Surface Explorer from Orbit (PASEO) is a wideband radiometer and spectrometer operating at 520-600 GHz that will provide a factor of two improvement in sensitivity over existing planetary instruments. The sideband separated output of the mixer enables an instantaneous output bandwidth of 40 GHz, providing simultaneous spectrographic observation of several important atmospheric species.

The focus of this project is to develop the necessary components to demonstrate this instrument in preparation for future flight missions. An orthogonal-mode transducer is the first component in the receiver. This separates the polarization of the incoming signal into two channels. Then a waveguide twist is used to rotate one of these channels to the polarization of the sideband separating mixer. Each channel enters a balanced mixer that produces two IFs of 20 GHz bandwidth.

A significant portion of this project is the integration of these components into a single, high-density package. This will be accomplished by forming the passive components with Deep Reactive Ion Etching (DRIE) of silicon. By using silicon micromachining to form the waveguide components and housing of the system, the fabrication precision can be improved over that of tradition CNC machining. Techniques for coupling to the silicon devices using custom metal flanges will be discussed. VNA measurements of the silicon components will be compared with devices fabricated using standard metal machining fabrication techniques.