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Ultra Low Noise 600/1200 GHz and 874 GHz GaAs Schottky Receivers for SWI and ISMAR

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Omnisys Instruments is responsible for the 600/1200 GHz broadband front-end receivers and back-end spectrometer hardware for the Submillimeter Wave Instrument (SWI) part of the Jupiter Icy moons Explorer (JUICE) mission, and for the development of the dual-polarization 874 GHz spectrometer channels for the airborne icecloud imager instrument ISMAR. We will present our development of these highly integrated heterodyne receivers which are based on membrane integrated GaAs Schottky diode mixer and multiplier circuit technology, and InP HEMT MMIC LNA technology from Chalmers University of Technology. Preliminary results at room temperature on the 1200 GHz breadboard prototypes show on a typical DSB receiver noise below 3000 K in the 1030 GHz-1220 GHz frequency range with only 1-3 mW of LO power. For the 874 GHz receiver flight modules a record low double sideband noise of 2500 K was obtained with only 2.3 mW of LO pump power. Both the 1200 GHz and 874 GHz subharmonically pumped Schottky mixer designs have been based on the broadband SWI 600 GHz channel mixer design, which had a repeatable receiver noise performance below 1200K with less than 2 mW of pump power at room temperature. All together these results are setting new standards for critical receiver hardware operating at room temperature used in instrumentation for atmospheric research and remote sensing applications.

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