

The Surface Dust Analyzer (SUDA) on Europa Clipper

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Abstract

The Surface Mass Analyzer (SUDA) measures the composition of ballistic dust particles populating the thin exospheres that were detected around each of the Galilean moons. Since these grains are direct samples from the moons' icy surfaces, unique composition data will be obtained that will help to define and constrain the geological activities on and below the moons' surface. SUDA will make a vital contribution to NASA's Europa Clipper mission and provide key answers to its main scientific questions about the surface composition, habitability, the icy crust, and exchange processes with the deeper interior of the Jovian icy moon Europa.

SUDA is a time-of-flight, reflectron-type impact mass spectrometer, optimized for a high mass resolution which only weakly depends on the impact location. The small size, low mass and large sensitive area meet the challenging demands of mission to Europa. A full-size prototype SUDA instrument was built in order to demonstrate its performance through calibration experiments at the dust accelerator at NASA's IMPACT institute at Boulder, CO, with a variety of cosmo-chemically relevant dust analogues. The effective mass resolution of $m/\Delta m$ of 150-300 is achieved for mass range of interest $m = 1-150$.

In January 2018, SUDA has passed its Preliminary Design Review (PDR), a major cornerstone of the project. Flight prototypes of major instrument components including the high voltage and low voltage power supplies, the FPGA board, the ion detector, and the velocity detector have been designed and fabricated. The mechanical design of the sensor head will be finished in a few months.

In this talk I will report about the status of the instrument development, the mission design, as well as about exciting new impact experiments into water ice.