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Initial Calibration Results of the NIM Flight Spare Mass spectrometer for Exploration of Jupiter's Icy Moons Exospheres

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The search for life is one of the key topics in modern space science. The JUICE mission of the European Space Agency ESA will investigate Jupiter and its icy moons Ganymede, Callisto and Europa, with Europa being an example of a potentially habitable world around a giant gas planet. The Particle and Environment Package, PEP, on board of the JUICE spacecraft will investigate Jupiter's icy moons and their environment. The Neutral gas and Ion Mass spectrometer NIM will investigate the icy moon's exospheres to investigate their formation and the interaction processes of the exospheres with the moons' surface and Jupiter's strong magnetic field. It will enhance our understanding of the processes involved in the interactions of ion bombardment on the icy moons' surfaces. From these measurements, we will derive the moons' surface composition and their formation processes.

NIM is a time-of-flight mass spectrometer with two particle entrances: an open-source entrance to measure neutral particles and ions directly and a close source entrance where neutral particles get thermalized before entering the sensor's ionization region. This allows detecting of particles with high speeds. NIM has a specially designed ion storage source and an ion-mirror to double the flight distance of the produced ions by keeping the sensor at a minimal size.

In this contribution, we show calibration results of the NIM flight spare instrument on one hand operated with laboratory and on the other operated with flight electronics. We demonstrate the performance of NIMs ion-source, verify the performance of the closed-source antechamber. NIM has a demonstrated mass resolution of $m/\Delta m$ 800.