We performed measurements with the prototype NIM using a neutral gas beam of incident velocity in the n-mode: Species area / 10-9 mbar [a.u.] for each mass range in n-mode and th-mode. Moreover, the direct comparison of the n-mode (open source) and th-mode (closed source) gives results of these measurements with respect to fragmentation and density enhancements in the closed source mode are presented here. Furthermore, we give a direct comparison between open and closed source mode measurements.

Thermal (th-mode) neutral beam (n-mode) are thermally accelerated to ion temperature by several collisions inside an equilibrium sphere (antechamber) between entering the ion source and are then ionized by an electron beam, used for neutral gas measurements at any ionization phase, mainly of Europa torus covering and all other flybys.

Neutral (n-mode) open source) neutral beam (n-mode) enter the ion source with scattered velocity and are then ionized by an electron beam, used for neutral gas measurements close to the moon (orbit or closed approach at flyby).

Ions (n-mode open source) ions (n-mode) enter the ion source with scattered velocity and are directly guided through ion optics to the detector, used for thermal ion measurements close to the moon (orbit or closed approach at flyby).

The verified mass range in n-mode and throttle lasts from 2 (H2) up to 86 amu (Bi) in which NIM would support up to 750 amu for a 20 μg measurement.

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Density enhancement model is given by following formual from [6] and is primary velocity and mass dependent.

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\frac{N_{\text{in}}}{N_{\text{in,ref}}} = \left( \frac{v_{\text{in}}}{v_{\text{in,ref}}} \right)^{2} \left( \frac{M_{\text{in}}}{M_{\text{in,ref}}} \right)^{-2} \]

where \(N_{\text{in}}\) is the closed source number density, \(N_{\text{in,ref}}\) is the open source number density, \(v_{\text{in}}\) the primary gas temperature, \(\theta_{\text{sp}}\) the ion source temperature, \(v_{\text{sp}}\) the scatter velocity and \(\theta_{\text{sp}}\) is the angle between the entrance aperture and the mass of the gas.

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