



Imaging ion mass-spectrometer for magnetospheric and planetary applications

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3-dimensional panoramic ion mass-spectrometer with complete un-obscured instantaneous $> 2\pi$ field-of-view is described. It is based on the imaging ion optics that is feeding time-of flight gated mass-spectrometer. Ions from the hemisphere entering narrow circular slit of cylindrically symmetric outlay are converted to narrow-angle cylindrical beam that passes through second narrow circular slit. This beam then pass to mass-spectrometer which keeps directional information about initial angular distribution of the ion flux. The gate that forms the beam for time-of-flight analysis is located within the imaging optics between the first and second narrow slits. Distributions of ion fluxes over hemisphere for mass-separated ions with given energy per charge are imaged on MSP-based detector. Only energy scan is required to measure 3-D ion velocity distributions of ions. Electro-optics scheme provides flexible control of the energy bandwidth and angular resolution. Two narrow slits and multiple light reflection from electrodes ensure strong UV rejection. With only one scan left, this instrument provides more detailed velocity distribution and more reliable mass-composition due to its un-obscured wide-angle field of view. It is less susceptible to time aliasing and can provide high temporal resolution due to larger instantaneous sampling of velocity space. Panoramic ion mass-spectrometer can be used both on spin-stabilized and 3-axis stabilized spacecraft.

PICAM instrument based on this approach is currently developed for ESA's Bepi Colombo mission. Another version of this instrument - DI ion analyzer is under devel-

opment for Roscosmos' Phobos-Soil mission. Panoramic ion analyzer is included in Roscosmos' magnetospheric mission Resonans. We describe concept and properties of this ion analyzer.

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