

Mars Express ion mass spectrometer for Mars plasma environment. The lessons of the instrument design and data analysis.

A. Fedorov¹, S. Barabash², and R. Lundin²

¹IRAP-UPS-CNRS, Toulouse, France, Andrei.Fedorov@irap.omp.eu, ²IRF, Kiruna, Sweden

Summary submitted to:

The International Workshop on Instrumentation for Planetary Missions – Sep 3, 2014

1. Introduction: Looking forward to MAVEN data in the near future, we asking ourselves what did we obtain and what did we miss with Mars Express plasma data regarding the phenomenon of the martian induced magnetosphere and the martian ionosphere escape. The present paper describes the IMA mass-spectrometer belonging to ASPERA plasma package. We show main results of IMA data analysis and the instrument constraints leading to some loss in our understanding of processes in the martian magnetosphere.

2. The instrument: IMA is a top-hat classical ion analyzer combined with an elevation angle steering deflector and a magnetic mass spectrograph. The IMA system design and IMA position on Mars-Express is shown in Figure 1.

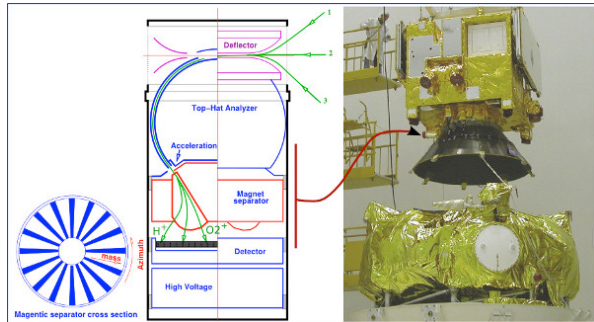


Figure 1 Instrument design diagram and (left) and the sensor position on the spacecraft (right)

3. Results and measurement limitations: The IMA data collected from 2014 up to now can give us excellent statistical results about planetary heavy ions distribution in the planetary induced magnetosphere (Figure 2) .

We are discussing the measurement limitations and their consequences for the scientific results as follows:

- 1. CO₂⁺ and D⁺ resolution
- 2. Energetic pick-up plume detection
- 3. IMA field-of-view restrictions

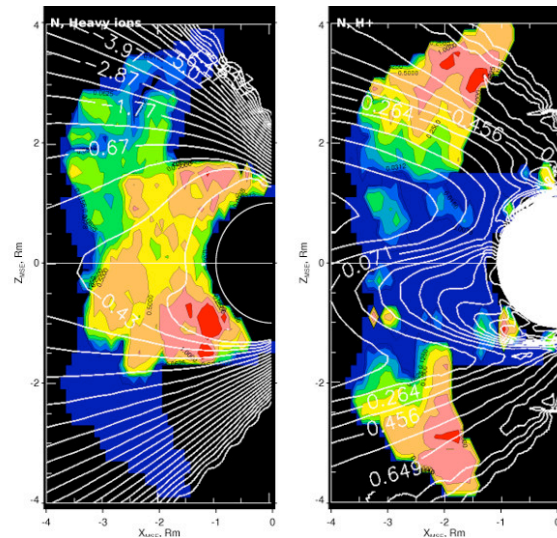


Figure 2. Heavy ions (left) and solar wind (right) number density