

# Science Expectations for the Interstellar Dust Experiment (IDEX) onboard the Interstellar Mapping and Acceleration Probe (IMAP) Mission



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## IMAP MISSION:

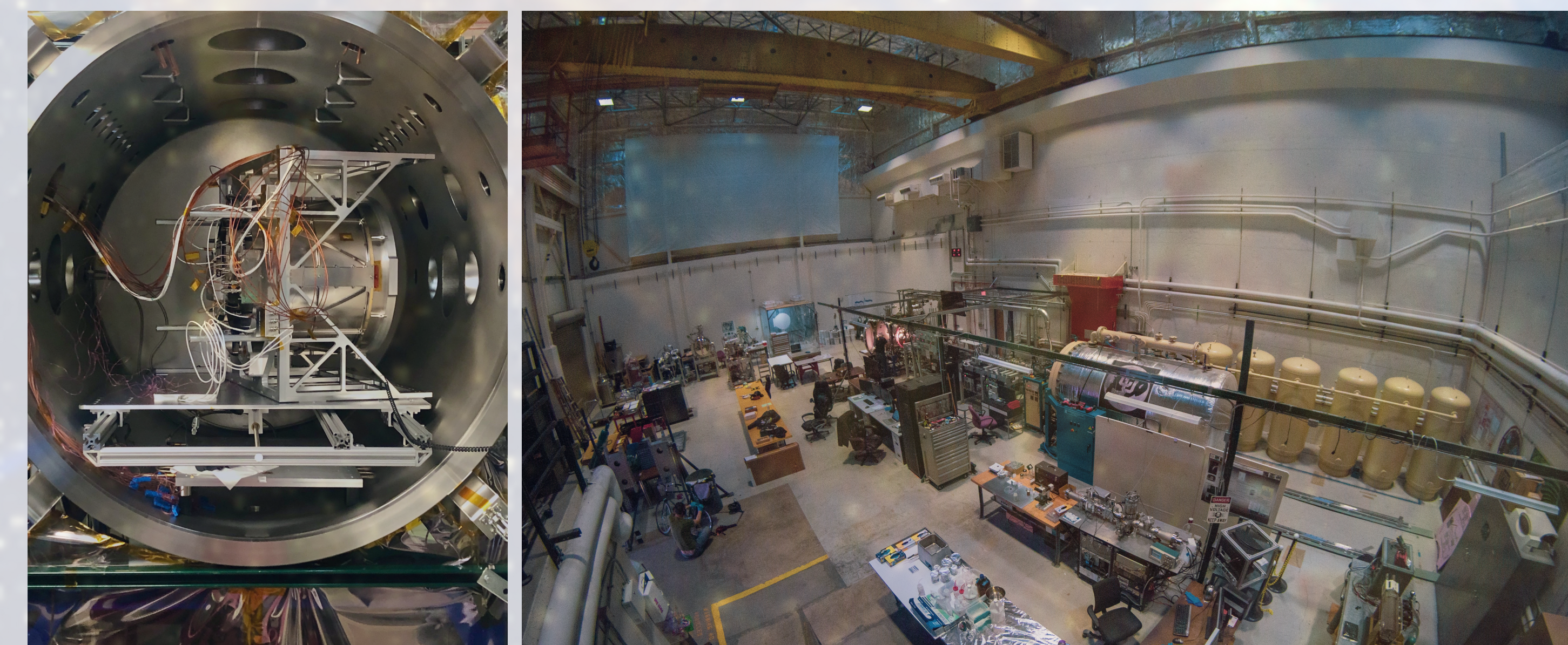
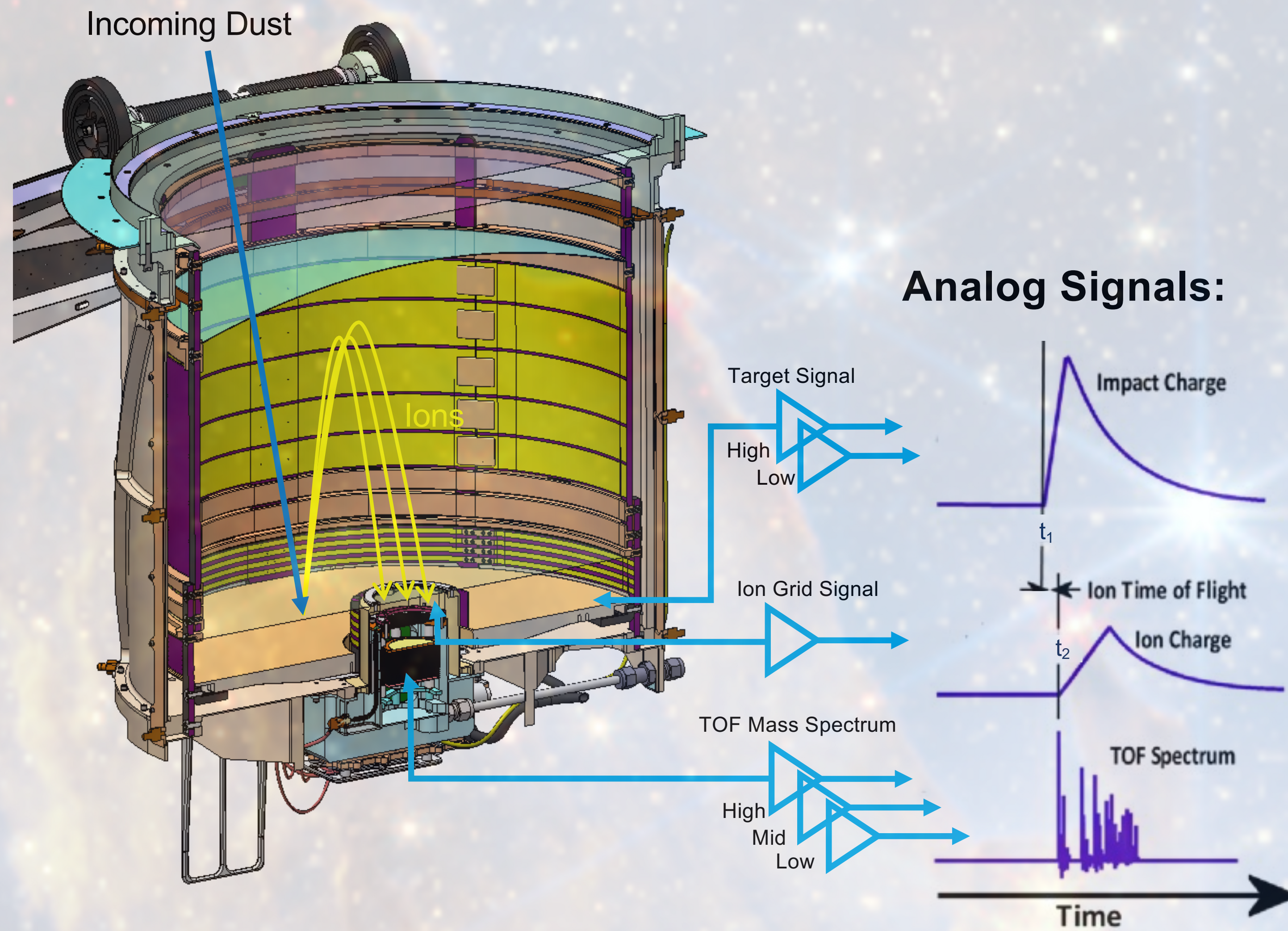
The Interstellar Mapping and Acceleration Probe (IMAP) is scheduled to launch in 2025, to be stationed at the Sun-Earth L1 Lagrange point with a combination of 10 in-situ and remote sensing instruments. IMAP will improve our understanding the composition and properties of the local interstellar medium. The local interstellar medium contains plasma, magnetic fields, neutral atoms, cosmic rays, and **dust** which all influence the heliosphere through interconnected time-dependent and multi-scale processes.

## IDEX Goals:

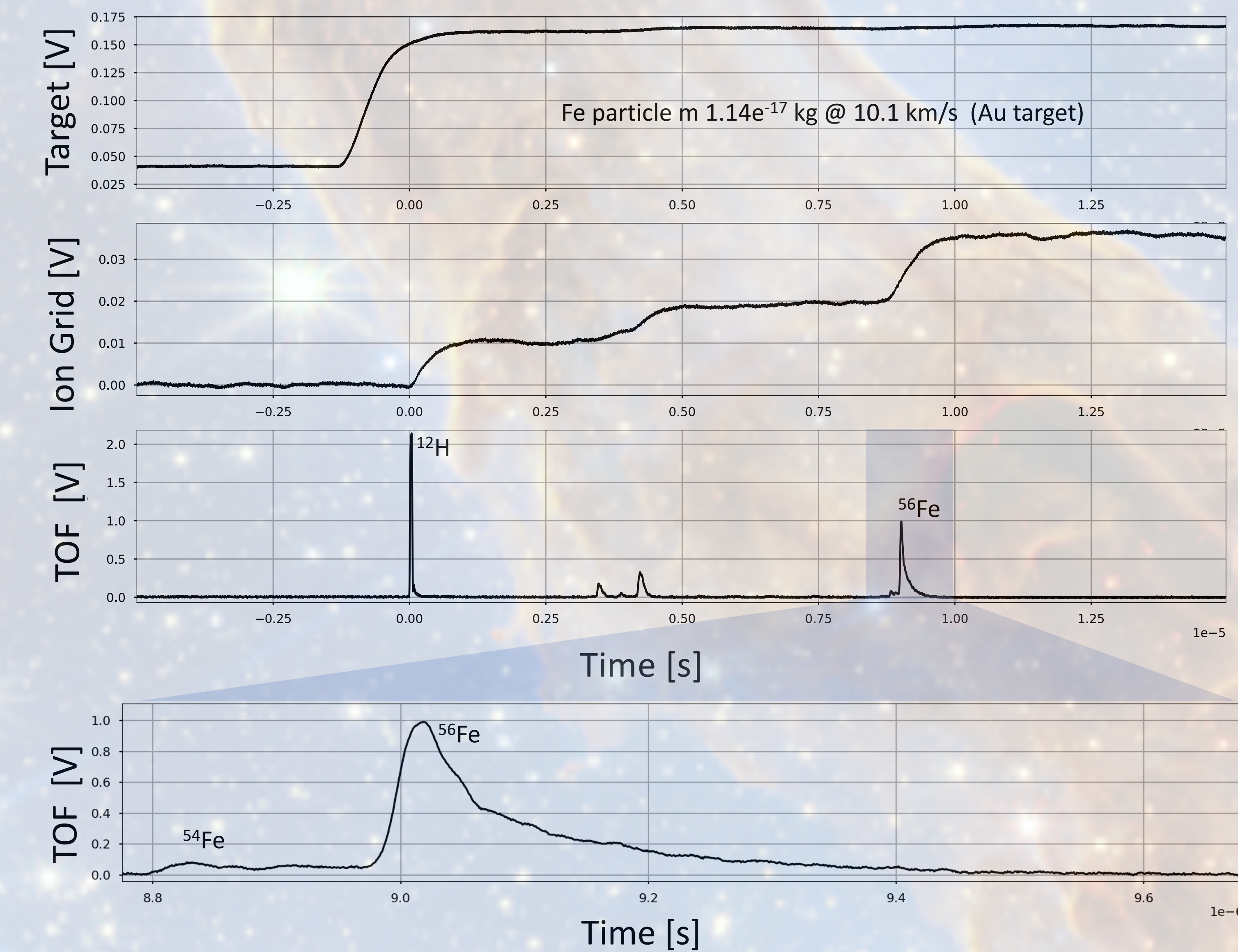
- 1) measure the flux, size distribution, and composition of interstellar (ISD) particles, characterizing the inflowing solid matter from the local interstellar medium reaching the inner heliosphere;
- 2) detect the shared pool of interplanetary dust particles (IDP) of cometary and asteroidal origin to determine whether they preserve unprocessed pre-solar molecular cloud particles or show signatures of processing in the solar system;
- 3) identify the basic organic material from asteroids and various cometary families to determine if they share a common source or formed from distinct reservoirs.

## IDEX INSTRUMENT:

Dust detection is based on impact ionization, where elemental and molecular ions are generated in a high velocity dust impact and analyzed in a time-of-flight (TOF) setup. The Engineering model has been tested and calibrated at LASP's dust accelerator facility.



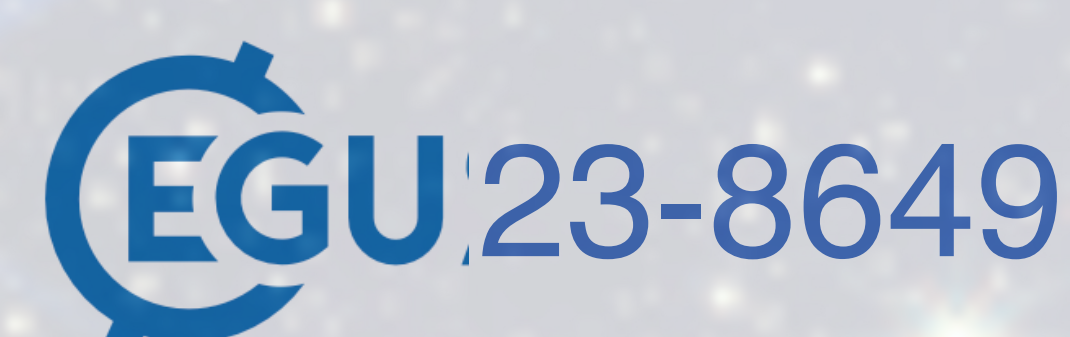
## IDEX ENGINEERING MODEL TEST RESULTS:



## IDEX PREDICTED PERFORMANCE:

Based on the EM test results IDEX will detect ISD & IDP in the mass range of  $2 \times 10^{-13}$  -  $5 \times 10^{-11}$  g, in the speed range of 30-55 km/s, and composition mass range of 1-200 amu with a mass resolution of  $m/\Delta m > 100$  at  $m = 100$  amu. IDEX effective collection area is  $\sim 600$  cm<sup>2</sup>, and it is predicted to detect about 100 ISD during its prime (2025-2027), and about 600 ISD during its first extended mission (2028-2030). IDEX will also detect about 2000 IDP/year.

**IDEX WILL MEET ALL ITS REQUIREMENTS!**



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