

# GSFC IRAD

## Foil – MCP – TOF Mass Spectra

### Gated TOF Ion and Neutral Mass Spectrometer

Fast electric gate replaces start foil to eliminate ~20kV HVPS, does not interfere with molecules

Pre acceleration ~200V for moderate mass resolution ~10-20 M/dM

Primary noise source: UV and scattering

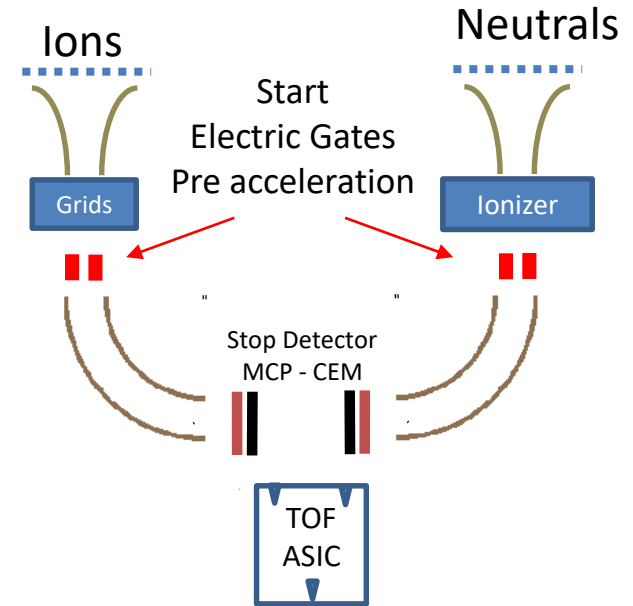
Optional ESA for UV rejection and out of band particle noise rejection

Mass resolution limitations: size of gate and instrument, improved mass resolution w TOF path correction, Limitation: Fast HV electric gate

Thermionic ionizer for neutrals – emission current ~1mA

TOF binning for mass analysis according to  $tof \sim \sqrt{m}$

Advantages: non-distractive, electronic sensitivity control



### Large aperture Low Energy Energetic Neutral Atom Imager

Large aperture for high sensitivity

Charge particle rejector with HV plates and grids

Composition H, He, CNO, Ne

Highly polished surface converts neutrals to ions at low energies, foil at higher energies

Micro collimator defines angular resolution in the range of 2-10 deg

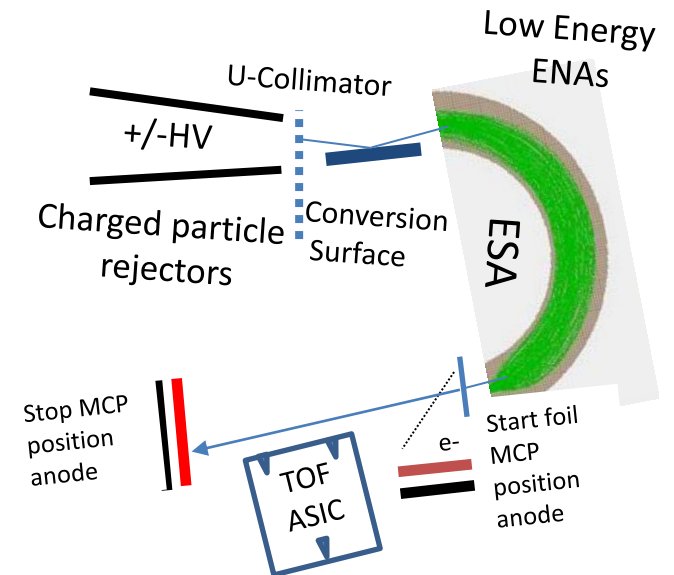
Wide gap ESA for signal collection, energy analysis DE/E 20-30% and UV attenuation

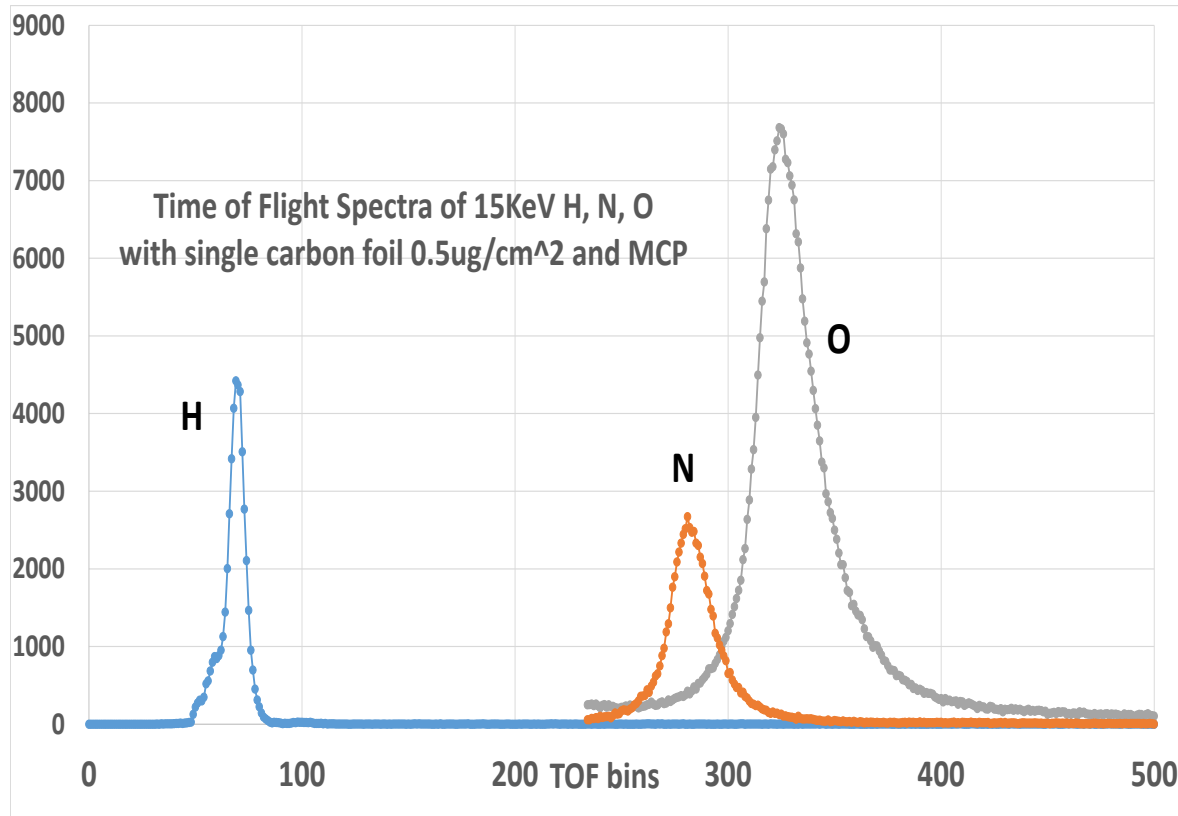
Post acceleration ~20KV, Foil – foil MCP TOF system

Magnets for electron rejection

Triple time coincidence + position anode coincidence for high S/N  $>10^4$

Fast TOF ASIC electronics





Time of Flight mass spectra of 15keV H, N, O beam from the lab prototype of a 0.5ug/cm<sup>2</sup> carbon foil - MCP TOF sensor. Separation of N,O demonstrates  $M/dM \sim 12$ .