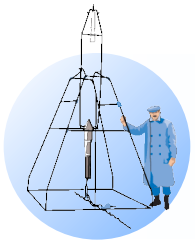


DRIVEN

(Deployable Radial Imaging for Velocity, Energy, Number)

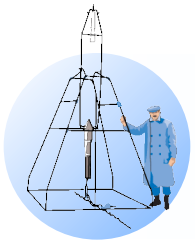
Innovation Fund 2010 Report

T E Moore

Code 670

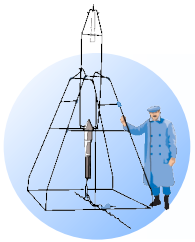
1 October 2010

GODDARD SPACE FLIGHT CENTER

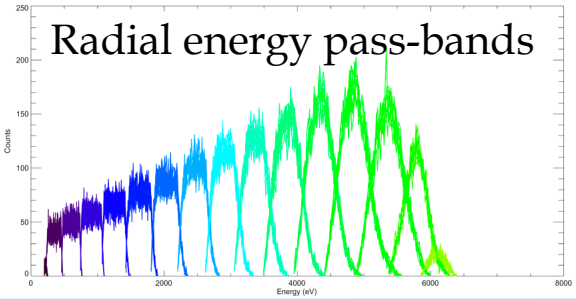


Background

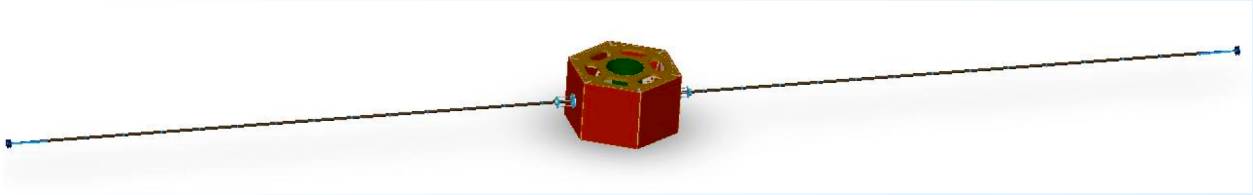
- A new capability to measure plasma velocity, energy, and density accurately, rapidly, and comprehensively, independent of spacecraft charging, to provide observations of: “All the plasma; All of the time”
  - A boom deployment system 1 – 6 m away from payload/ spacecraft.
  - Particle optics design to image energy radially on a circular micro-channel plate detector
  - High pixel count, rapid readout imaging interface to keep most electronics on the spacecraft
- Sensor at end of boom to be compact, with low power requirements (3V rather than 5V)

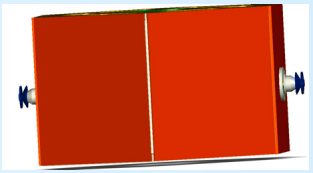


Approach

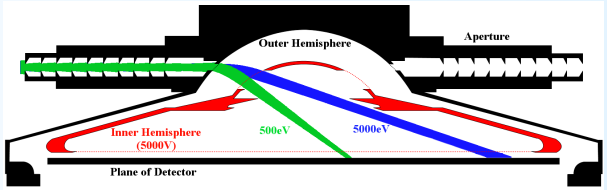


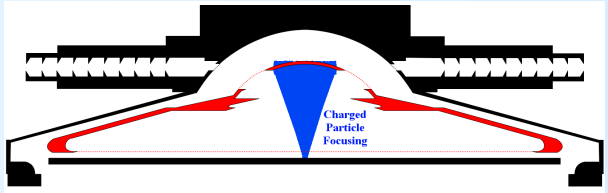
Deployment at end of stacer boom with up to 6m extent, based on design for Radiation Belt Storm Probes mission

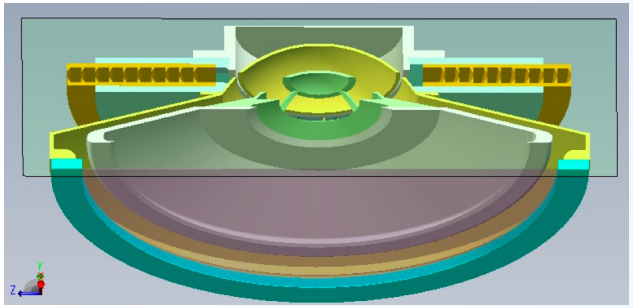




Extensive charged particle optics ray tracing simulations led to refined optics with excellent azimuthal and energy focusing properties

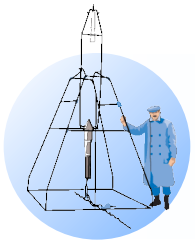






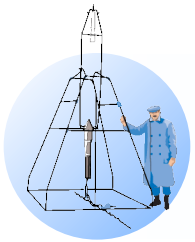
IPP-funded 3D mechanical model of optics for imaging energy radially, arrival direction azimuthally

Ready for fabrication and lab testing with Quantar focal plan imager purchased with IPP funds, pending vendor selection for compound curved screens over openings in spherical shells



Results

- Proposed and refined science requirements
- Developed trade space for imaging techniques
- Recruited Dr. David Knudsen of U. Calgary for a sabbatical year at Goddard to join DRIVEN team
- Suitable designs identified for 1m and up to 6m booms
- Developed Concentric Shell Analyzer optics design and mechanical model/ design
- Obtained and tested COTS detector/phosphor/CMOS imaging components to build prototype system
- Near future milestones (FY2011):
  - Fabricate CSA optics prototype, test with Quantar imager
  - Test prototype with flight-like CMOS imaging system
- TRL advanced from level 2 to level 3 in FY10



Future Expectations

- Proposal approved for FY 2011 IRAD to continue development
- Build/test prototype sensor, imaging, electronics, HVPS
- Identify potential customers or follow-on funding sources for this technology
  - Propose sounding rocket payload in FY2011
  - Heliophysics Roadmap STP-5 (Origin of Near Earth Plasmas) will require DRIVEN
  - Future Explorer-class mission opportunities
- Leverage GSFC's investment in technology to further improve our competitive posture:
  - Continue G. Collinson's key contribution as NPP
  - Collaborate with D. Knudsen/U Calgary during his FY11 sabbatical year at GSFC
  - Present and submit mission white paper to the NAS Heliophysics Decadal Survey in Nov. 2010