CINS – The Combined Ion and Neutron Spectrometer

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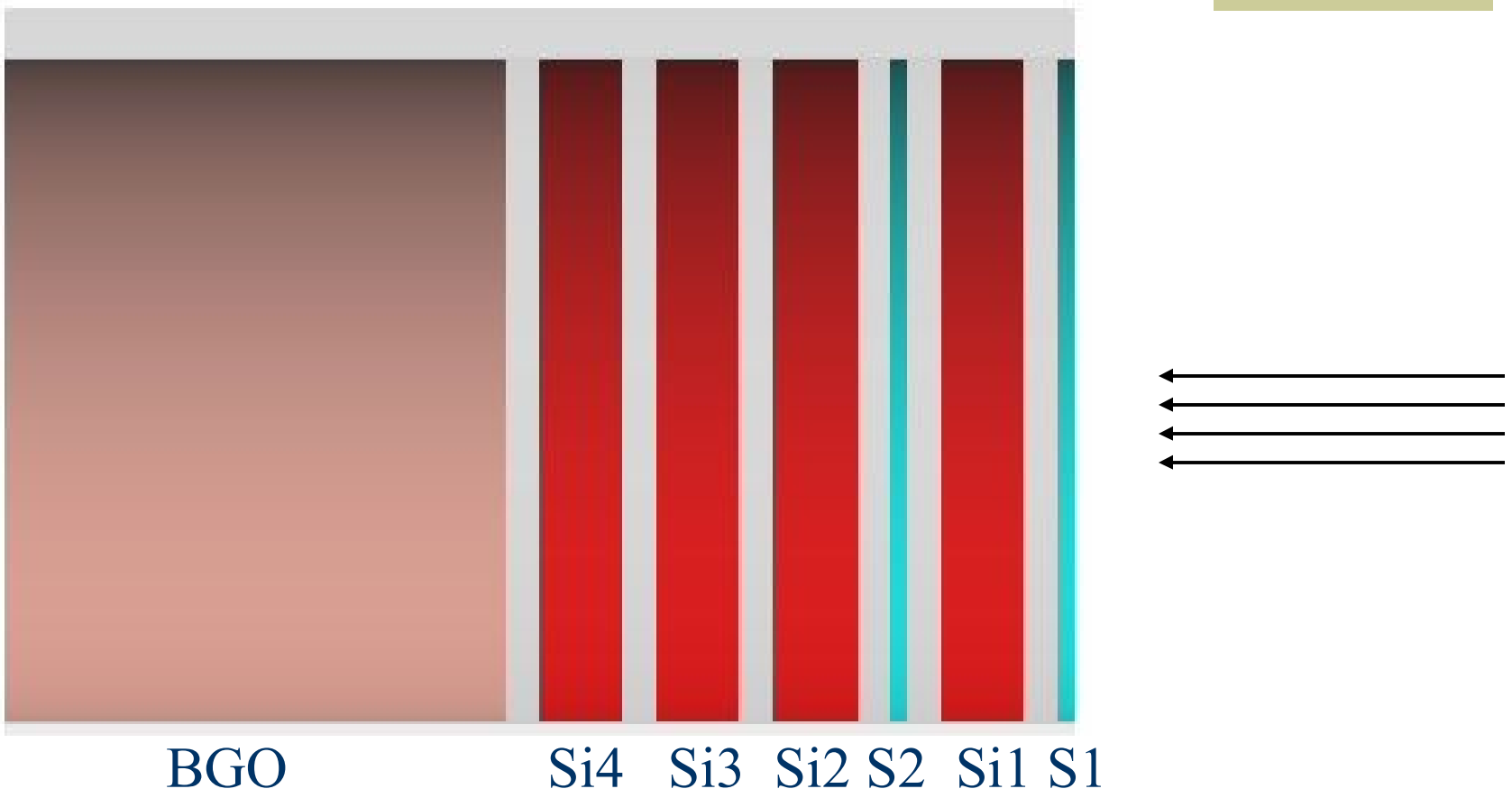
CINS concept

- Put charged particle detector and neutron spectrometer into a single unit with common electronics.
- Charged particle detector: silicon + plastic scintillators.
  - MARIE/IVCPDS design w/many improvements.
- Neutron spectrometer: Low, medium, and high-energy detectors.
- Funded by NSBRI.

Project Goals

- Demonstrate feasibility w/out regard to flight requirements.
- Extensive testing at accelerator facilities.
  - Emphasis on heavy beams, thick targets.
- In second generation instrument, reduce size, mass, power.

Charged Particle Stack



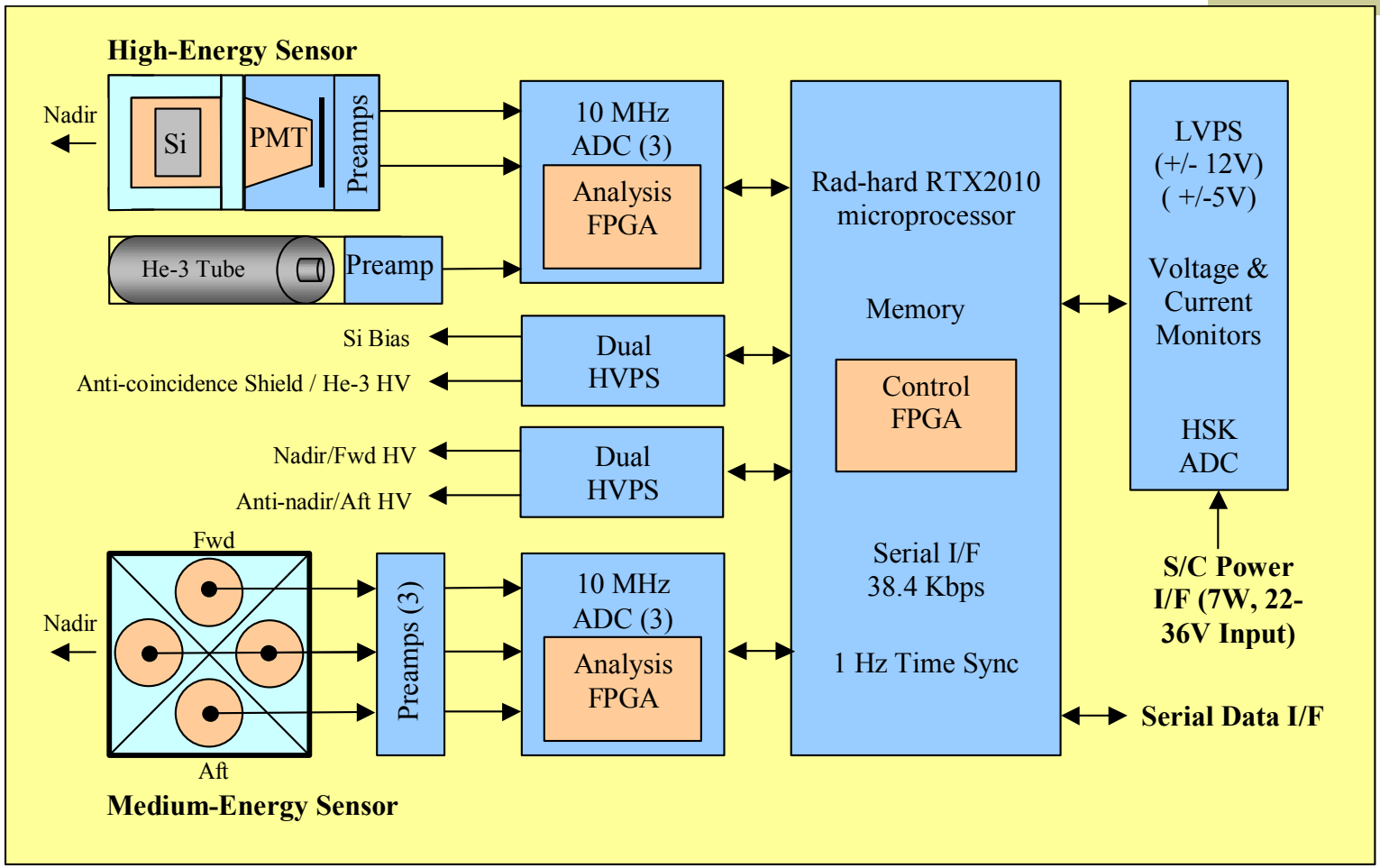
Charged Particle Stack

- Similar to MARIE in that 4 thick Si detectors provide particle identification and LET spectra.
  - MARIE dynamic range problem will be fixed.
- BGO adds mass, stops protons up to energy of 150 MeV, makes stack asymmetric.
- Plastic scintillators for triggers & simple counters, helpful in high-rate environments.

Neutron Spectrometer

- Three components:
  - ^{3}He tube for low energy (< 1 MeV)
  - Boron-loaded plastic scintillator (Eljen) for medium energy
  - Thick Si(Li) detector w/anti-coincidence shield for high energy
    - Unfolding to get incident spectrum is problematic.

NS Block Diagram



Flight Heritage

- Low- and medium-energy neutron sensors used on Mars Odyssey, Mercury Messenger.
- JHU-APL built readout for Messenger NS.
- High-energy sensor used on balloon flights.
- Charged-particle detectors from LBNL SSDL, built detectors for Voyager, ACE/CRIS, MARIE, etc.

Progress and Schedule

- Eight silicon detectors from LBNL group have been re-drifted by SSDL and guard rings added to 4.
  - Guard ring detectors to be used in both charged particle and high-energy neutron detectors.
- Boron-loaded scintillator has been procured.
- In 2006, complete mechanical design and begin assembly.
  - Aiming for Fall NSRL run for first test.
- GEANT4 model in good shape (D. Haggerty).

Summary

- CINS project may lead to a novel & useful instrument for flight.
- Project is just starting, we hope to have much more to report at 11th WRMISS.