Systems Engineering
(plus Data, Digital, Power)

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Who Am I?

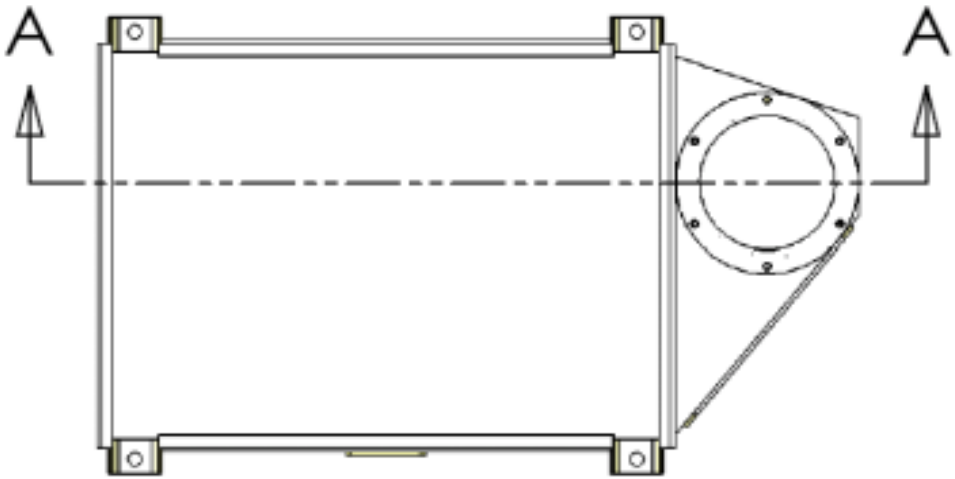
- Recent history: Project Engineer for
  - RXTE: All Sky Monitor and Experiment Data System *(in year 10 of operation)*
  - Chandra: CCD spectrometer *(in year 6 of operation)*
  - VOILA: a virtual reality experiment on ISS; cancelled last Fall.
- Currently:
  - Chief Engineer for Center
  - CRaTER Project Engineer

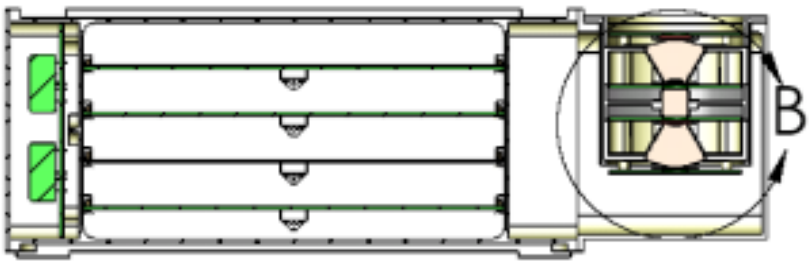
Engineering Web Site

<http://snebulos.mit.edu/projects/crater/>

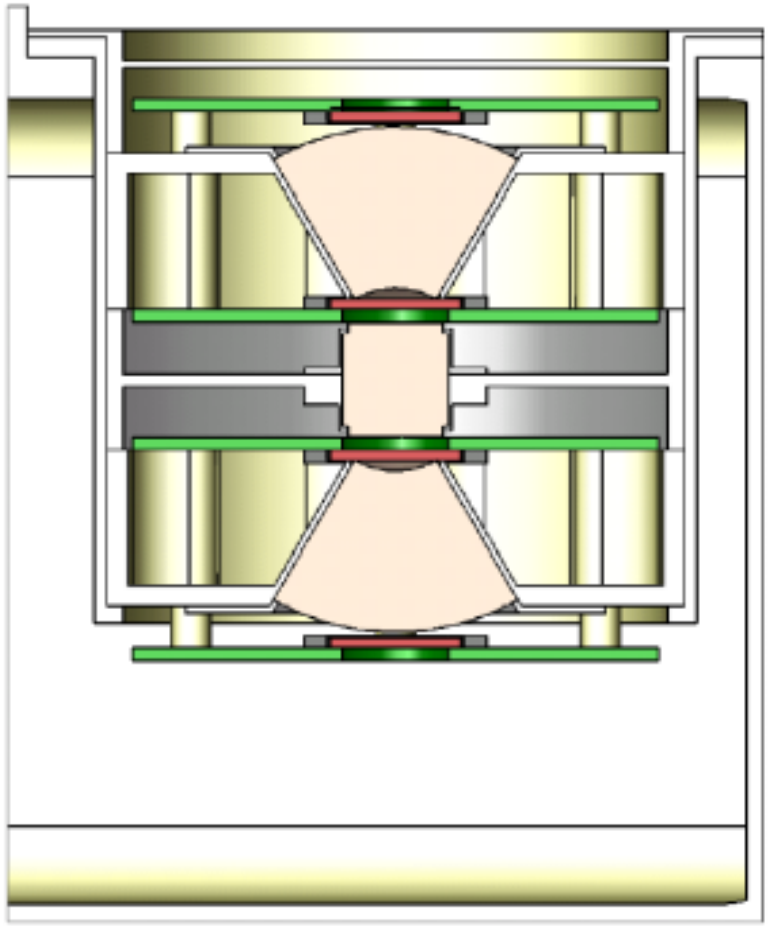
- Configuration Data Base
  - Repository for all past and present controlled documents, drawings, parts, *etc.*
  - Upload capability for ECOs and general info
  - Report generator
- Reference Documents

CRaTER Conceptual Design



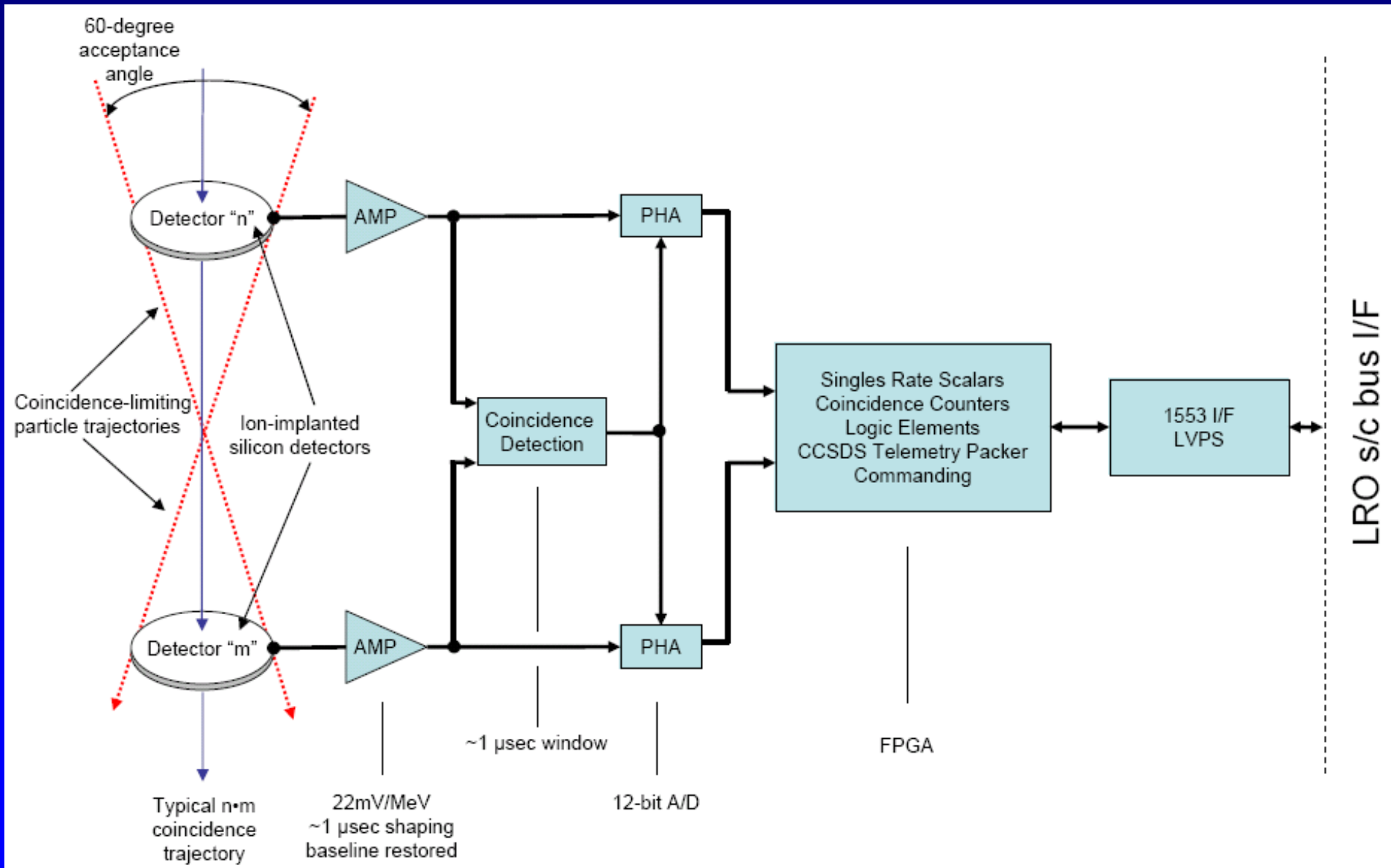


SECTION A-A



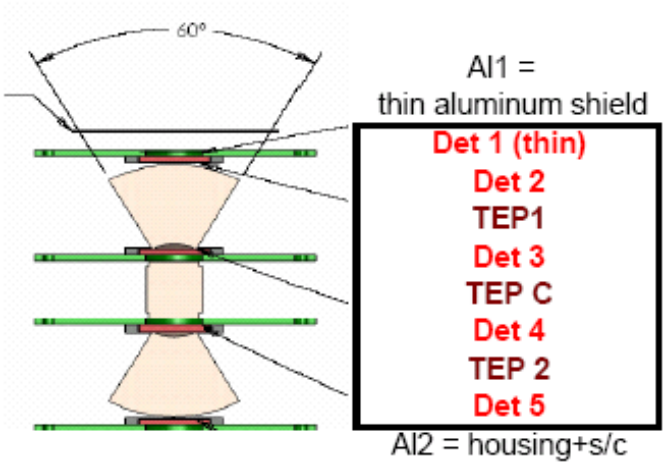
DETAIL B
SCALE 1 : 1

CRaTER Block Diagram



CRaTER Coincidence Logic

CRaTER Sensor Head Logic



Coincidences	*Comments on constraints of particle path lengths*
2•3•4•5	Poorly constrained
2•3•4•5	Al1 and TEP1 δl's well constrained
2•3•4•5	Al1, TEP1, and TEPC δl's well constrained
2•3•4•5	Scatter diagnostic
2•3•4•5	Scatter diagnostic; TEP1 δl still well constrained
2•3•4•5	Scatter diagnostic; TEP2 δl still well constrained
2•3•4•5	Scatter diagnostic
2•3•4•5	Al1, TEP1, TEPC, and TEP2 δl's well constrained
2•3•4•5	Poorly constrained
2•3•4•5	TEP1 and TEPC δl's well constrained
2•3•4•5	Scatter possibility
2•3•4•5	Al1, TEP1 δl's weakly constrained; TEPC δl well constrained
2•3•4•5	Poorly constrained
2•3•4•5	TEP2 δl well constrained
2•3•4•5	Poorly constrained

- Detector geometry and coincidences between detector signals allow for determination of “good” versus “bad” particle event
- “Good” event is one in which pathlength through stack is well-determined and from which LET can be determined

Flight Resources

- Mass Best Estimate
  - Proposal: 4.3Kg
  - Current WAG: 4.5Kg + x from Guilio
- Power Best Estimate
  - Proposal: 4.6W
  - Current WAG: 4.2W + A/D converters
- Data
  - Typical: 400bps Flare: 100Kbps

Data System Requirements

- 1553 interface to spacecraft
- CCSDS packets to data system
- 12 bit resolution of science data
- Flexibility to handle detector noise
- Flexibility to handle data rates
- Flexibility to handle event selection

Thermal System

- Not staffed up yet.
- With single layer MLI over both apertures and multilayer elsewhere, not a difficult problem.
- Six feet through which to conduct heat.
- Curious as to what thermal environment is predicted (hot is noisier for detectors than cold).

Flight Operations

- Instrument has one operating mode (currently 16 bytes of configuration data)
- CCSDS packets up and down
- Internal calibration is a single command
- External (flight) calibration is the regular operating mode, pointed off nadir.
- Will request real time engineering data feed.

Current Issues

- Power
  - Overhead cost of regulated power supplies
  - Rad-hard A/D converters
- Field-of-View and Accomodations
- Telemetry architecture
  - Reserved bandwidth for specific event classes?
- SEU error handling

Questions

- What is the schedule for Instrument ICDs?
- When will we see the Contamination Control Plan?
- Who is our contact for radiation info on parts?