Solar Probe Plus

A NASA Mission to Touch the Sun

Integrated Science Investigation of the Sun
Energetic Particles

Preliminary Design Review

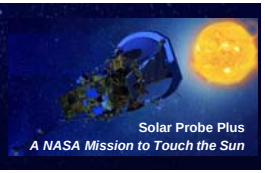
05 – 06 NOV 2013

ISIS Overview

Scott Weidner

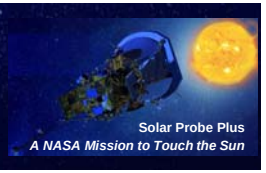
ISIS PM (SwRI)

Outline



- ISIS Organization Chart
- ISIS Suite
- Spacecraft Accommodation
- Changes since MDR
- Development Status
- Summary

ISIS Team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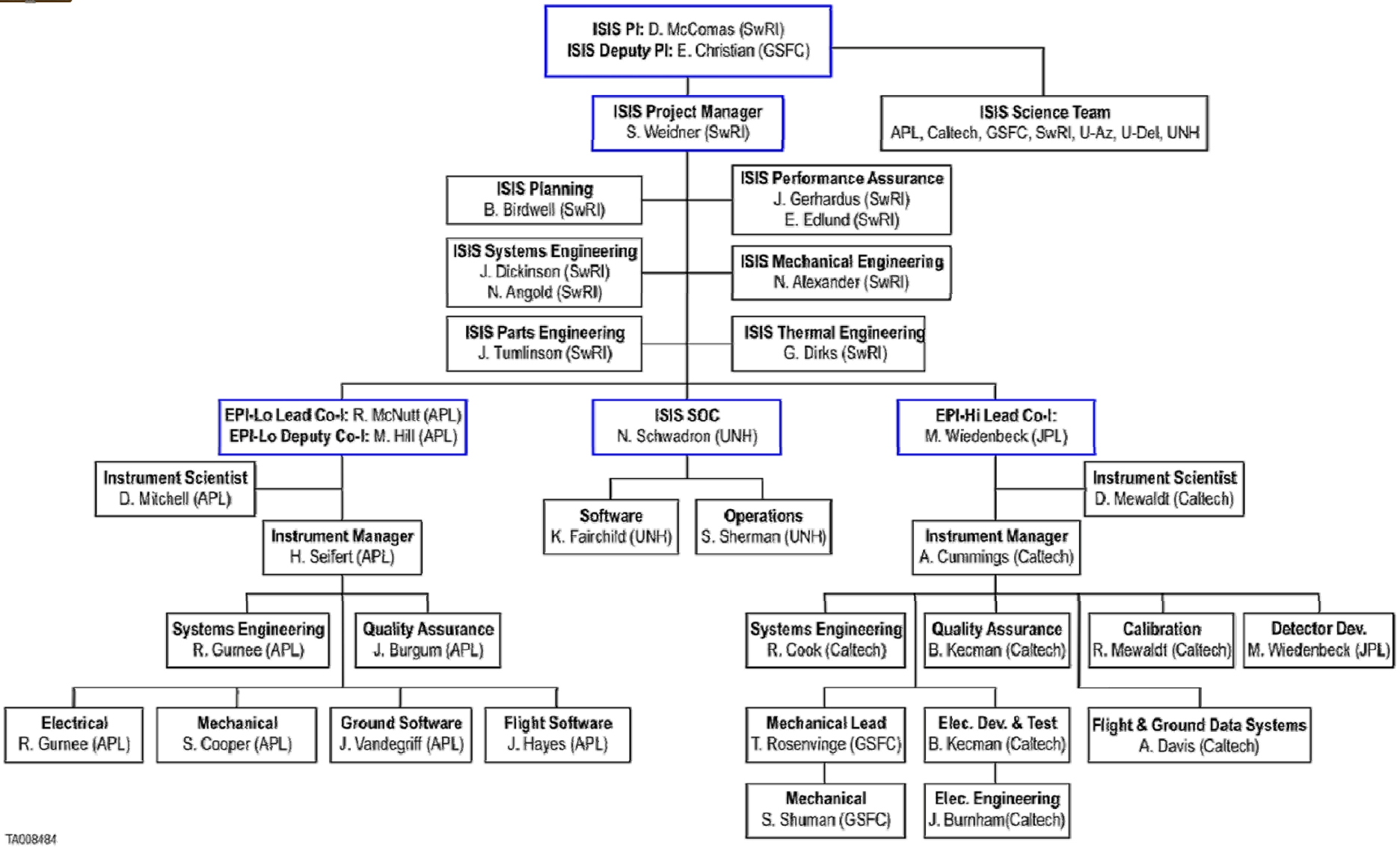
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Ground Software
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Flight Software
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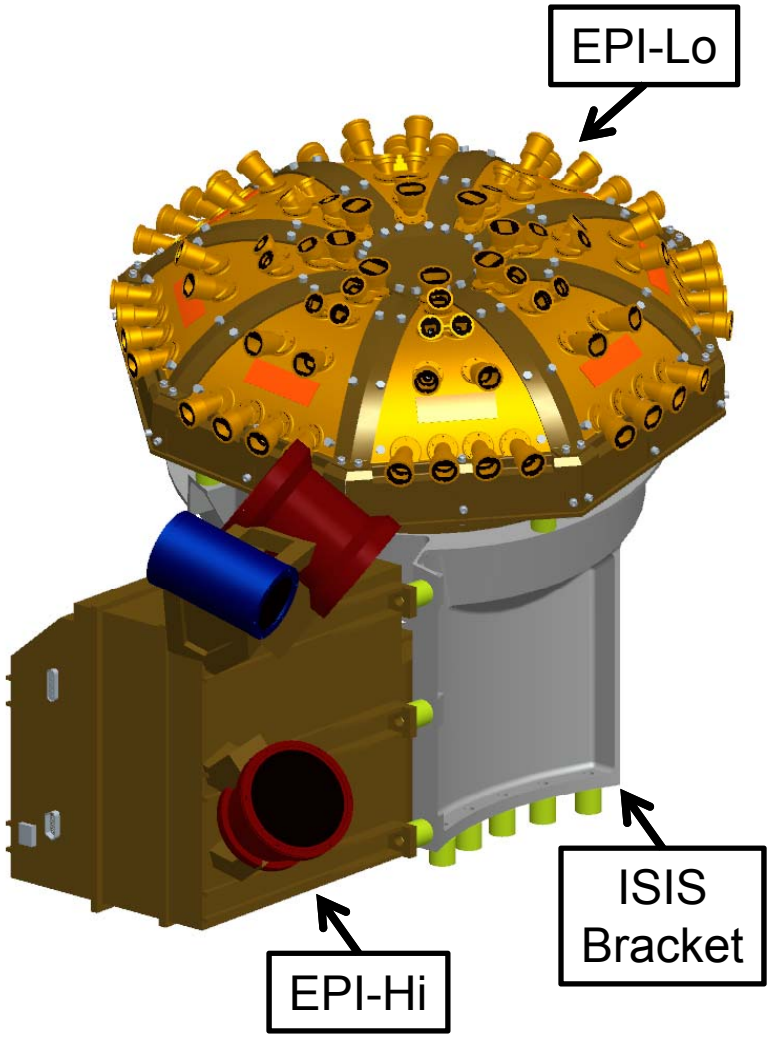
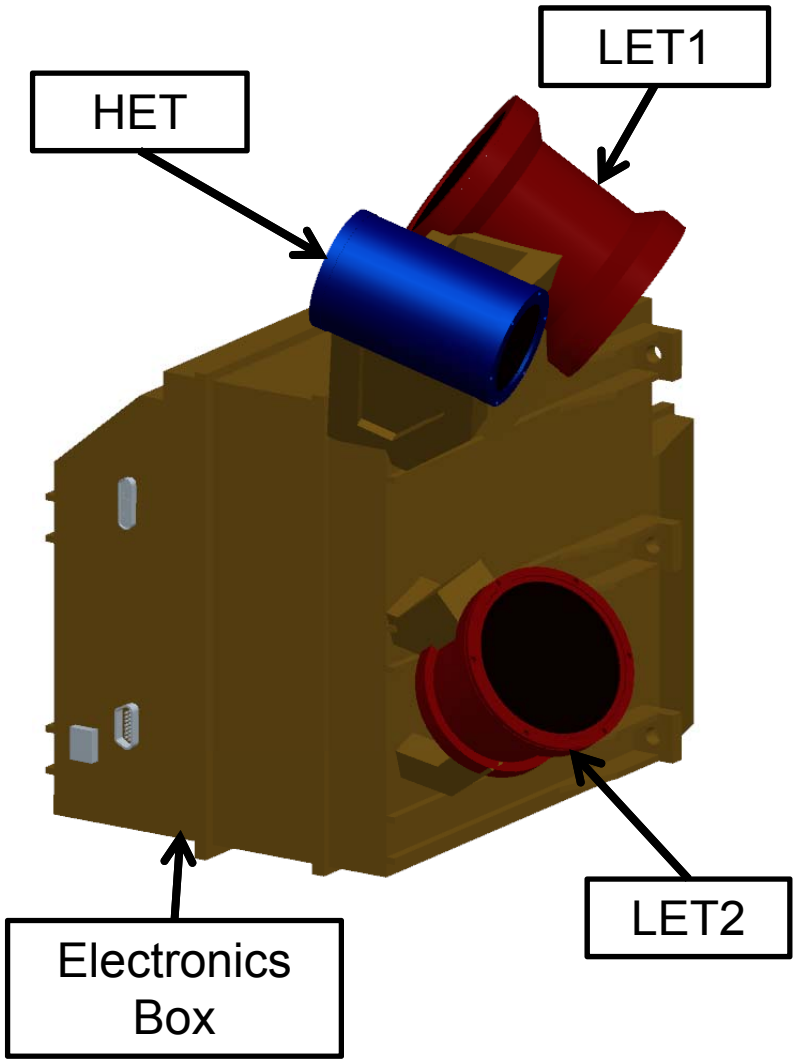
Flight & Ground Data Systems
A. Davis (Caltech)
Mechanical
S. Shuman (GSFC)
Elec. Engineering
J. Burnham(Caltech)
TA008484

ISIS Suite



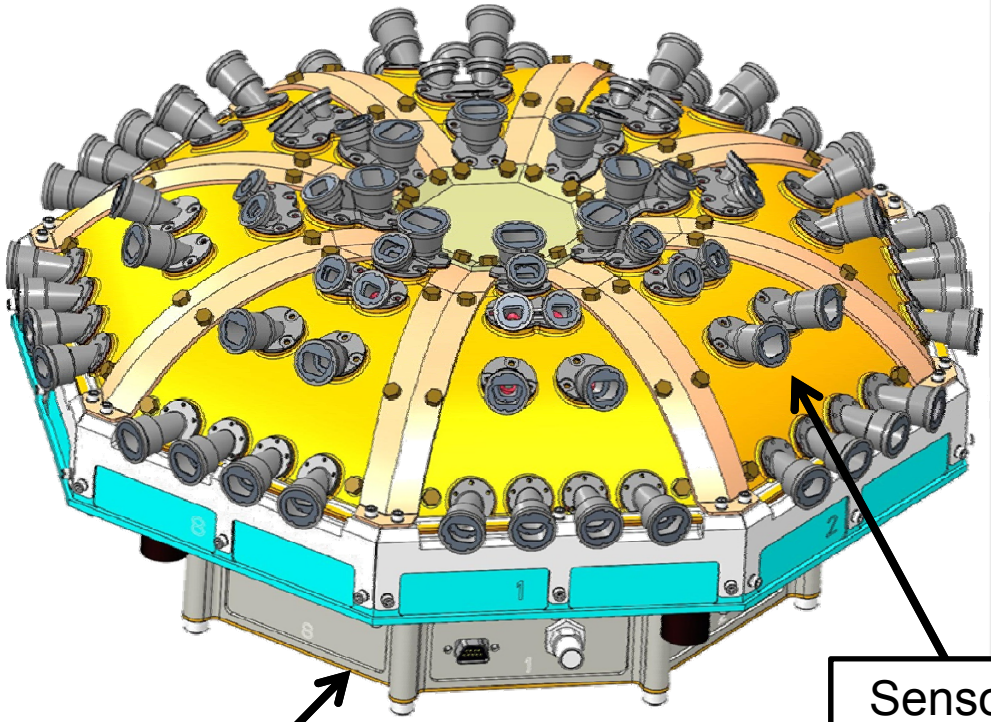
- ISIS Energetic Particle Suite
  - Measures energetic particles, including electrons, protons, and heavy ions
- Two instruments for wide energy coverage
  - EPI-Hi (Caltech, JPL, & GSFC)
  - EPI-Lo (JHU/APL)
- ISIS Allocations
  - Mass: 9.383 kg
  - Power: 11.768 W
  - Telemetry: 12 Gbit/orbit

ISIS EPI-Hi



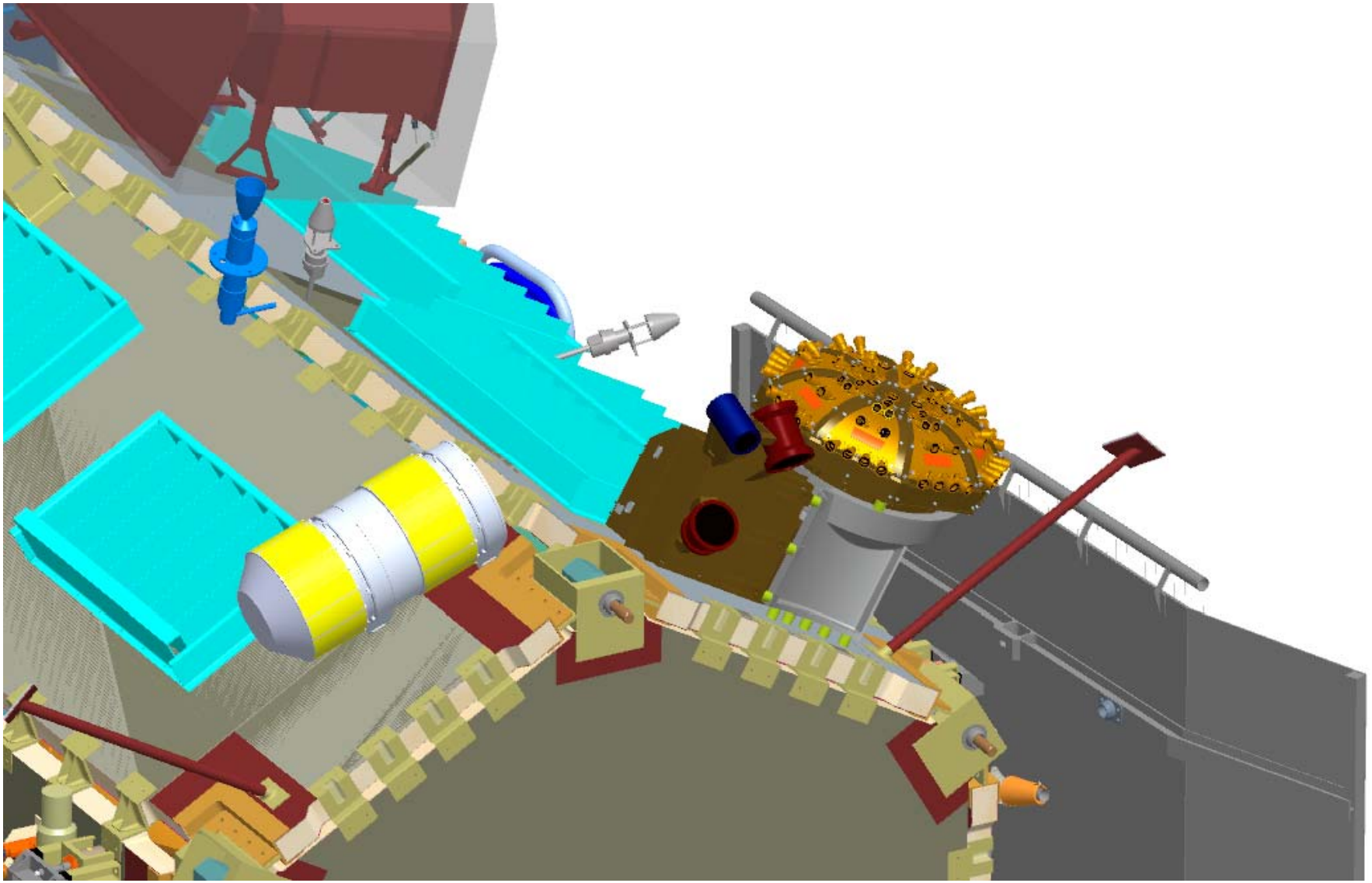
- Three Telescopes
  - HET – High energy
  - LET1 – Low energy
  - LET2 – Low energy, single-ended
- Energy Range
  - Ions:
    - 1 MeV/nucleon – 50 MeV/nucleon
  - Electrons:
    - 0.5 MeV – 3 MeV
- FOV: ≥π/2 sr in sunward and anti-sunward hemispheres (incl. 10° from S/C-Sun line)

ISIS EPI-Lo

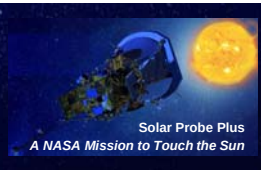


- 8 Wedges configured in 4 independent quadrants
- Energy Range
  - Ions:
    - 50 keV/nucleon – 15,000 keV Total E
  - Electrons:
    - 50 – 500 keV
- Nearly 2-π FOV

Spacecraft Accommodation

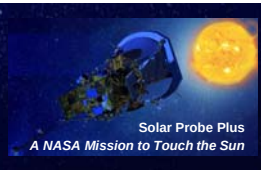


Late-Breaking Trade with the S/C



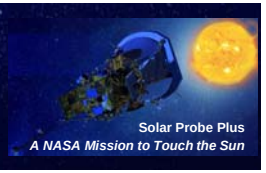
- New Solar Limb sensor appeared in S/C model near ISIS
- Analysis of the effect on our FOV is on-going
- No “show stoppers” expected but analysis and accommodation needs to be completed
- Working the process-issues with the Spacecraft team

Changes Since MDR



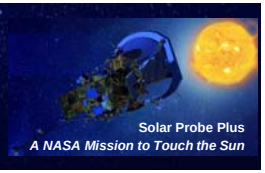
- No changes to Science
- EPI-Lo electronics box reduced in diameter and fits inside the ISIS bracket
- Updated design for EPI-Hi electronics box
- ISIS bracket modified to accommodate the Ebox changes
- Mass increased as part of risk-reduction process run by the SPP spacecraft when the nominal orbit was modified
- Power and telemetry have held steady with some reductions in uncertainty
- Two small additions
  - EPI-Hi added a background pixel
  - EPI-Lo added an anti-coincidence detector
  - Both of these use spare resources of existing electronics and provide large payoff for dynamic range

Development Status



- Successfully completed TRL6 Technology Developments
- Developed requirements flow-down with SPP Spacecraft
- ICDs with the Spacecraft are signed-off
- Preliminary analyses completed
- Prototypes of new circuits have been built and tested
- Completed preliminary designs
  - In most areas we are right on track
  - In some areas we are beyond a PDR-level and EM fabrication is underway
- Five different ASICs within ISIS
  - All have completed EM build or FM build
- We've brought in coast-to-coast teams to help Peer Review details of each subsystem

Summary



- In Phase B, the ISIS team has completed definition, preliminary design, and analysis work for the suite
- The presentations ahead will be taking you through all of the details
- We look forward to your feedback on our plans and preliminary designs