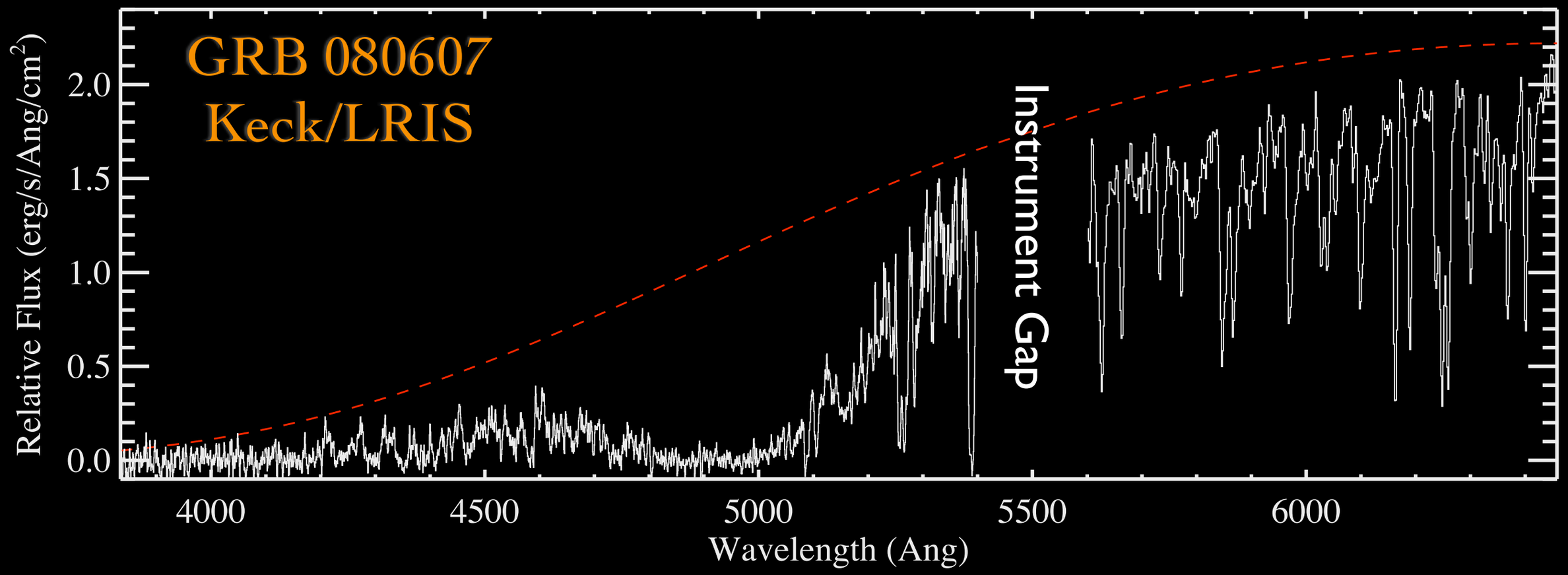
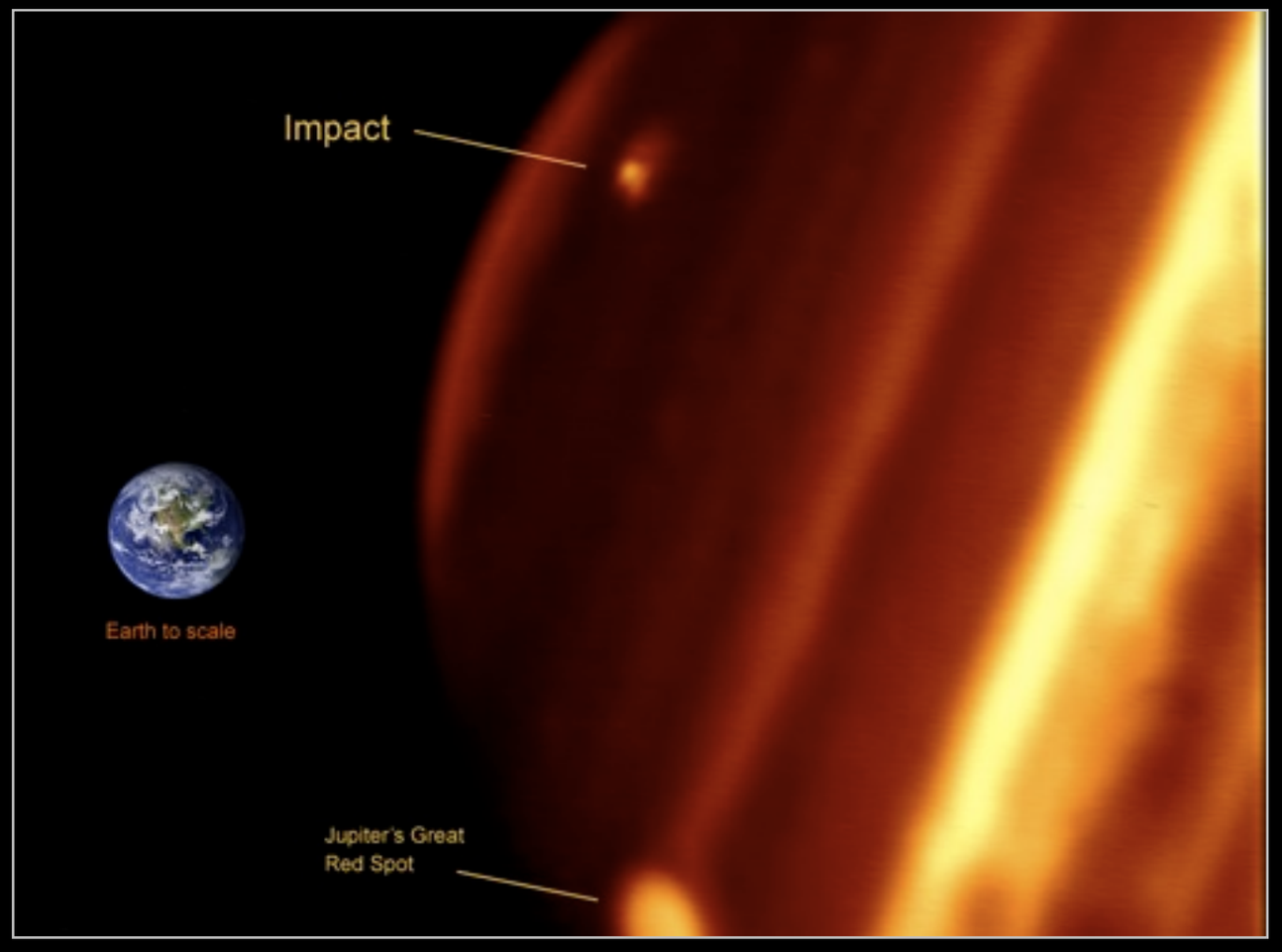
Flexibility / Time Domain Astronomy



J. Xavier Prochaska (UCO, UC Santa Cruz)

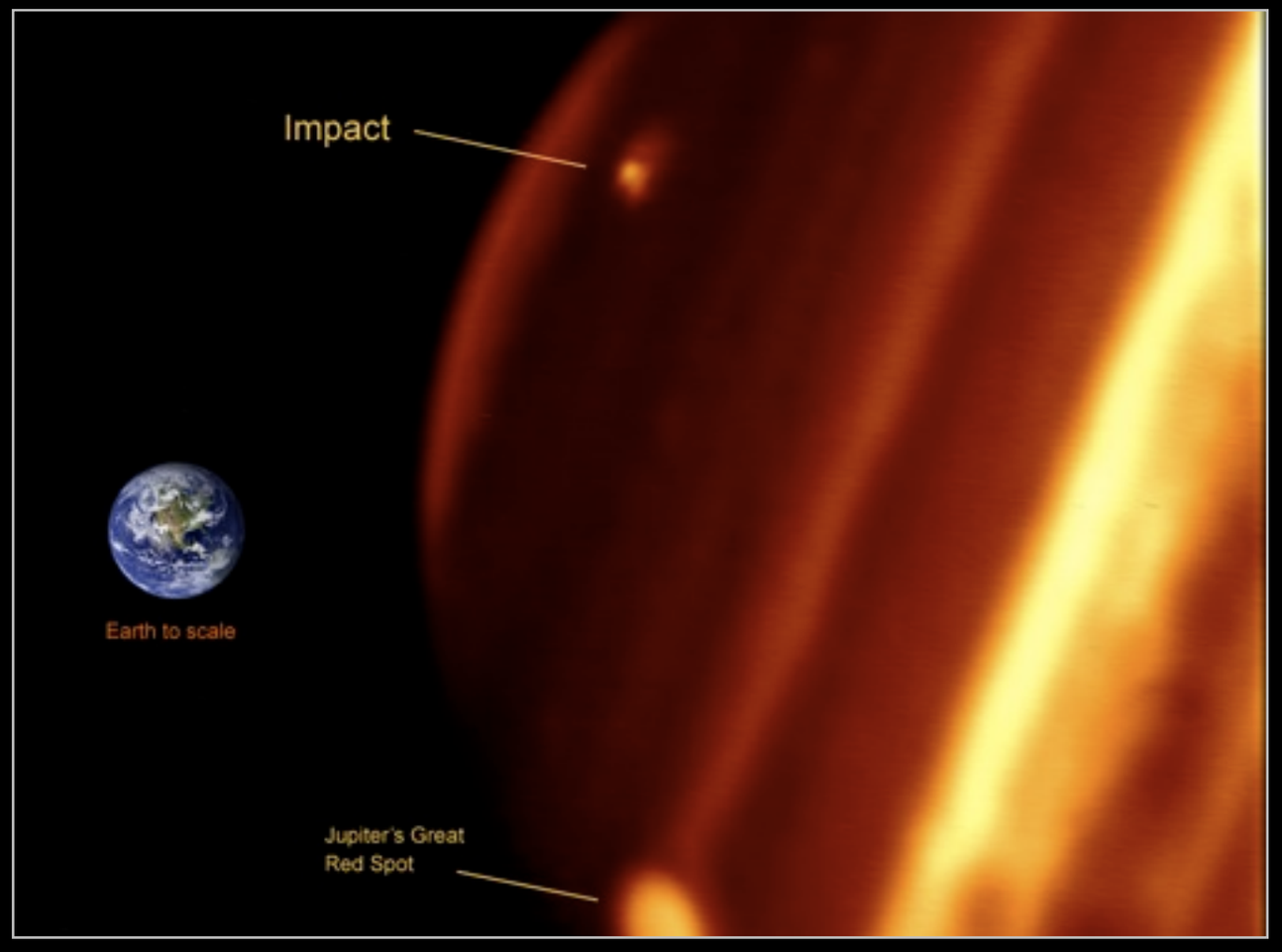
Promoting new ways to utilize the
Keck Observatory

Time Domain Astronomy: Purview



Time Domain Astronomy: Purview

- Target of Opportunity
  - Got to have it now, right now
  - Flaring, fading, transient sources
  - e.g. GRBs, collisions of all kinds



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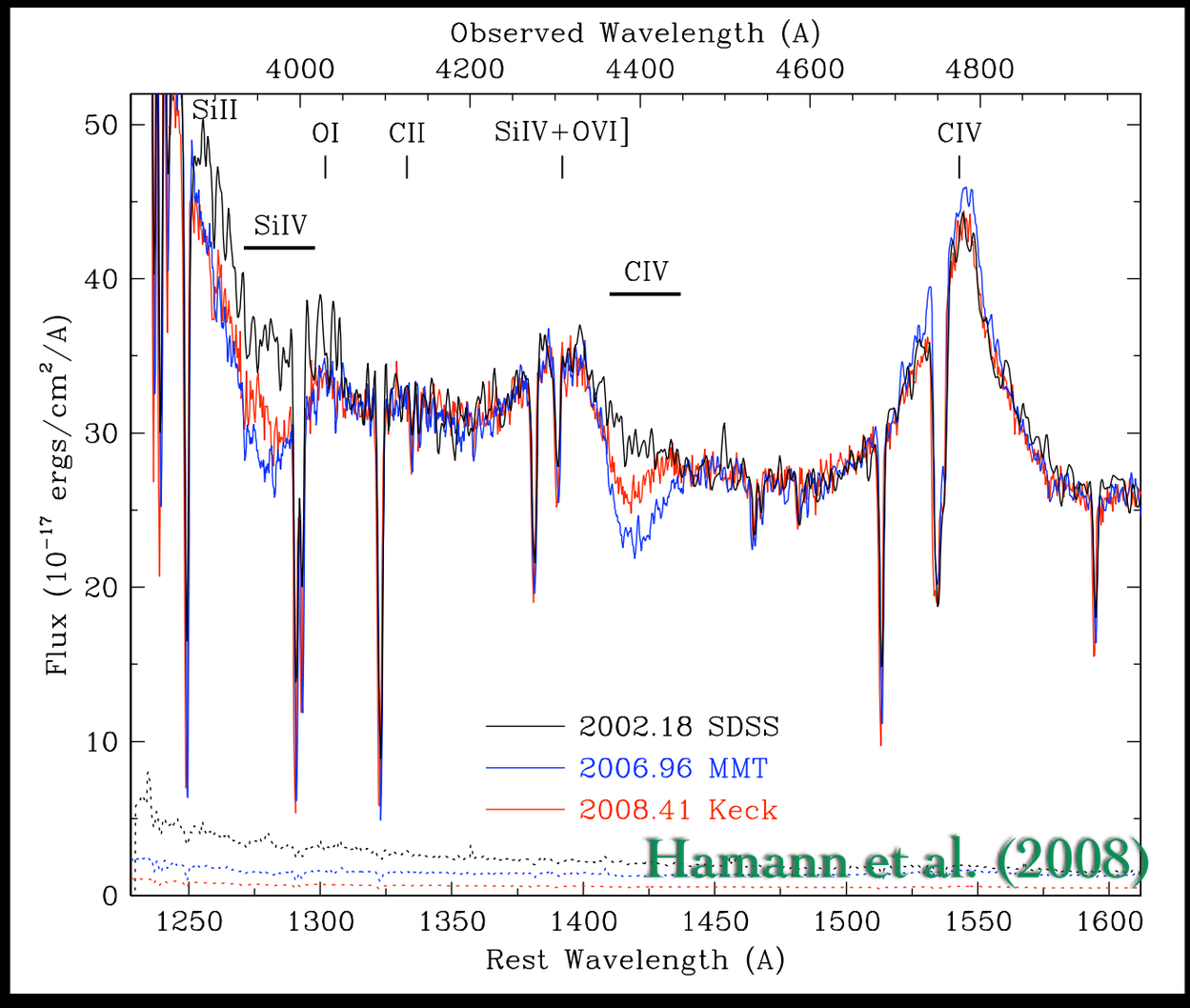

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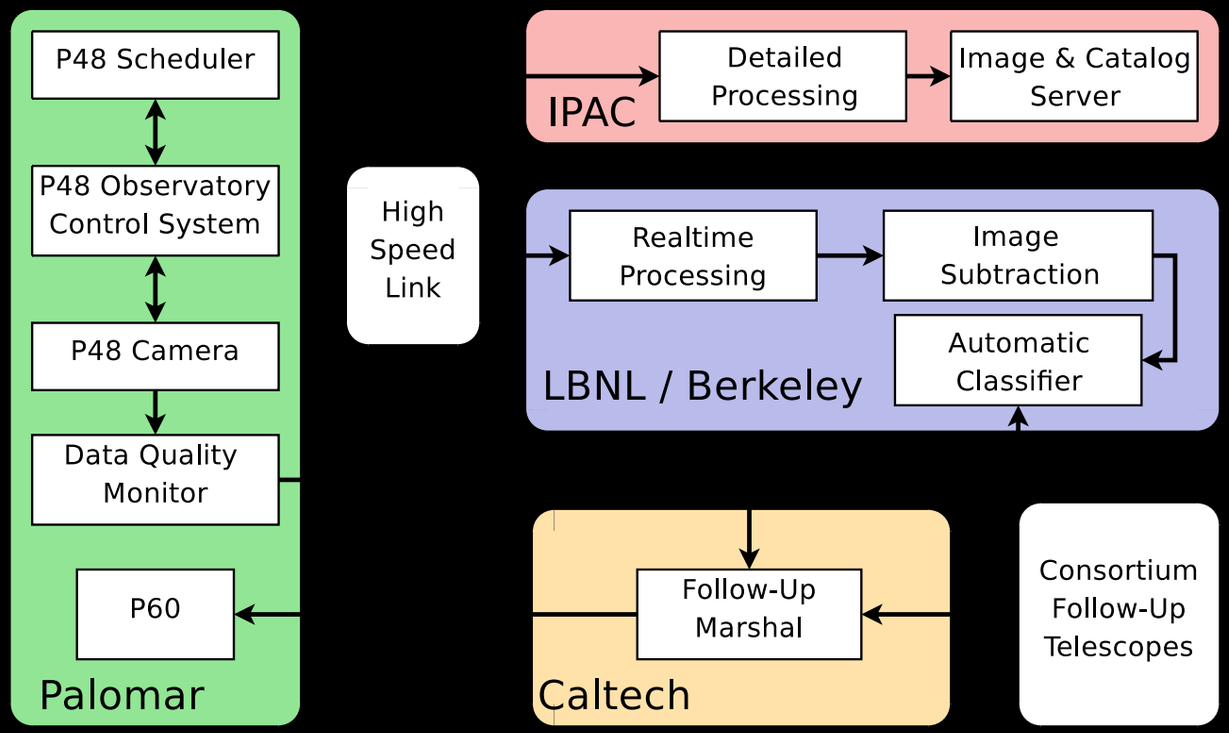
TDAWG Report (2006)

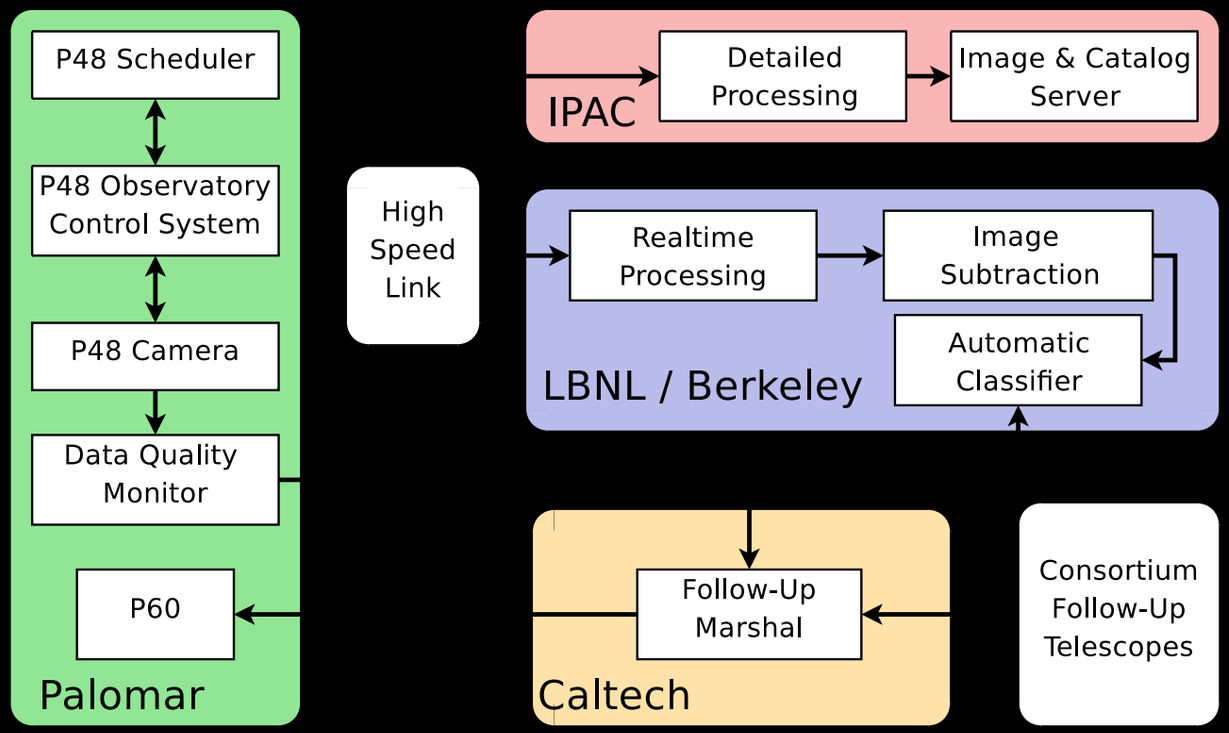
TDA: TrenDs in Astronomy



Law et al. (2009)

TDA: TrenDs in Astronomy

- Present projects
  - PTF, PanStaars
  - Full Northern sky imaging at high temporal cadence



Law et al. (2009)

TDA: TrenDs in Astronomy

- Present projects
  - PTF, PanStaars
  - Full Northern sky imaging at high temporal cadence

- Possible future
  - LSST, SASIR, Exist
  - Full sky in optical and IR
    - ✦ Intractable discovery rates

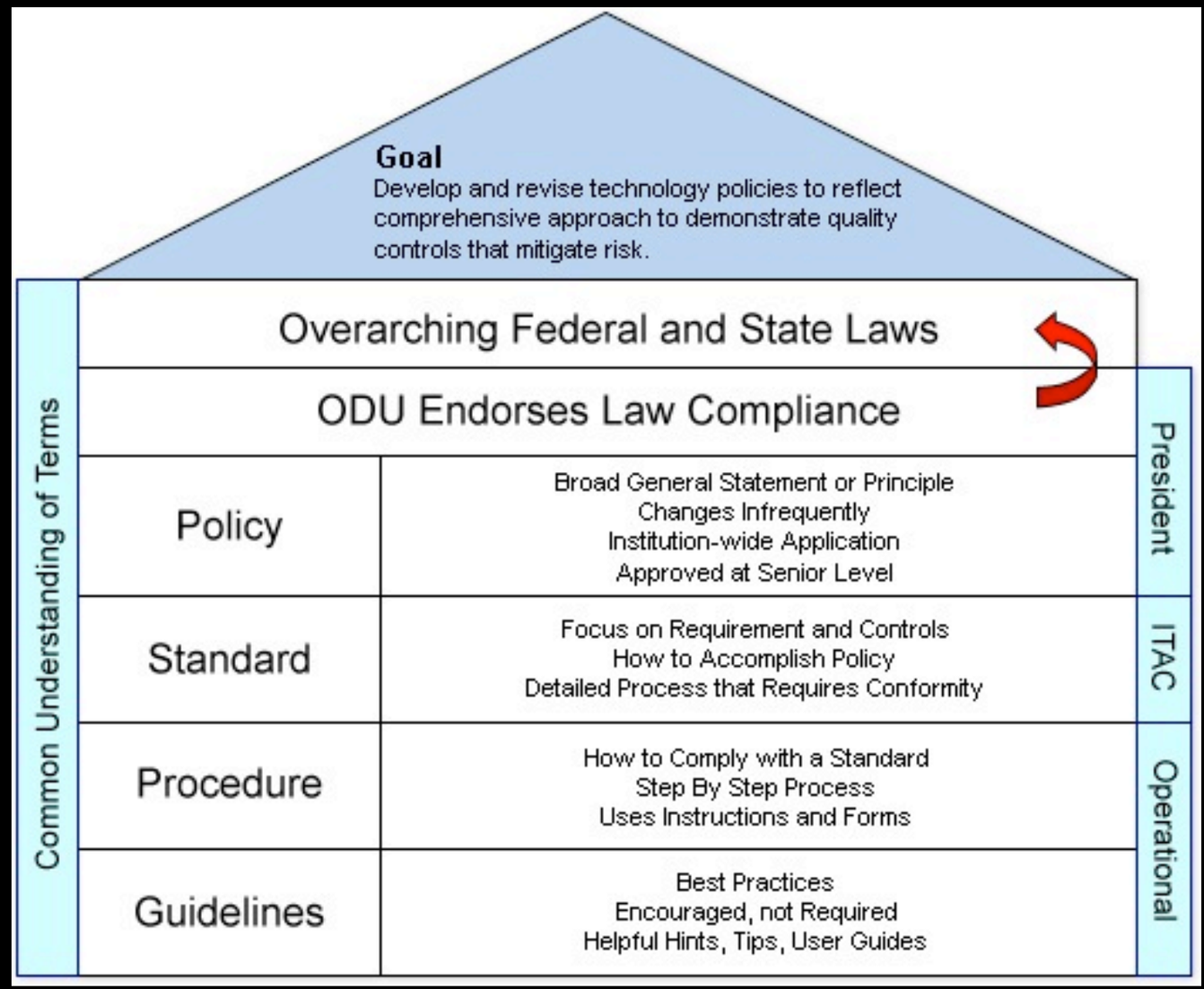
THE SYNOPTIC ALL-SKY INFRARED SURVEY

SASIR

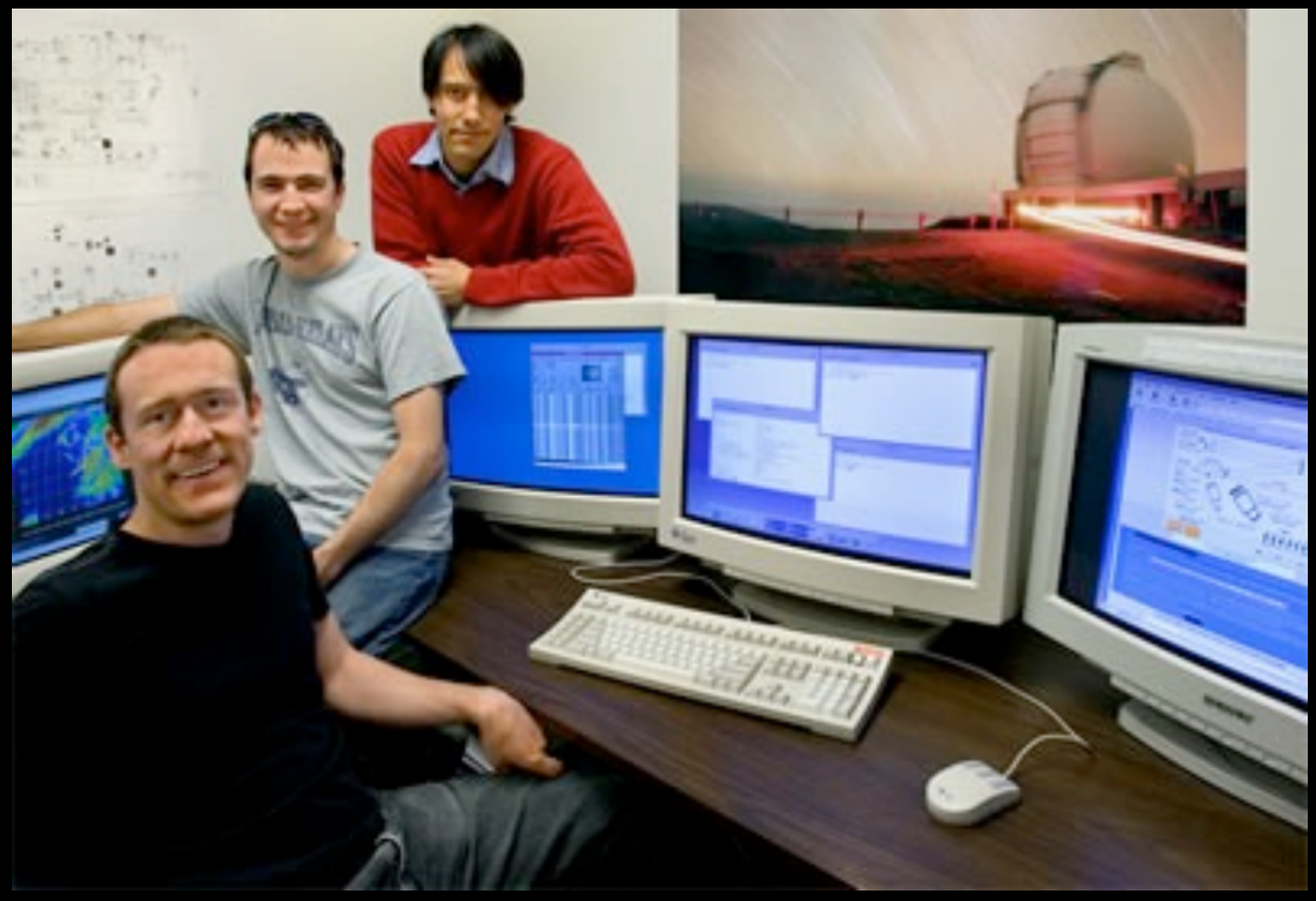
http://sasir.org

TDA at Keck: Policies

- Ideal: Full queue observing
- Current TDA policy
  - Each institution sets their own rules/guidelines
  - No formal cross-talk between institutions
    - e.g. TAC
- Possible paths
  - Uber-TAC
  - Keck involvement
    - Observatory-wide policy
    - Encourage multi-institution teams
    - Management of cadence scheduling
- Key issues
  - Data access + rights
  - Competing proposals

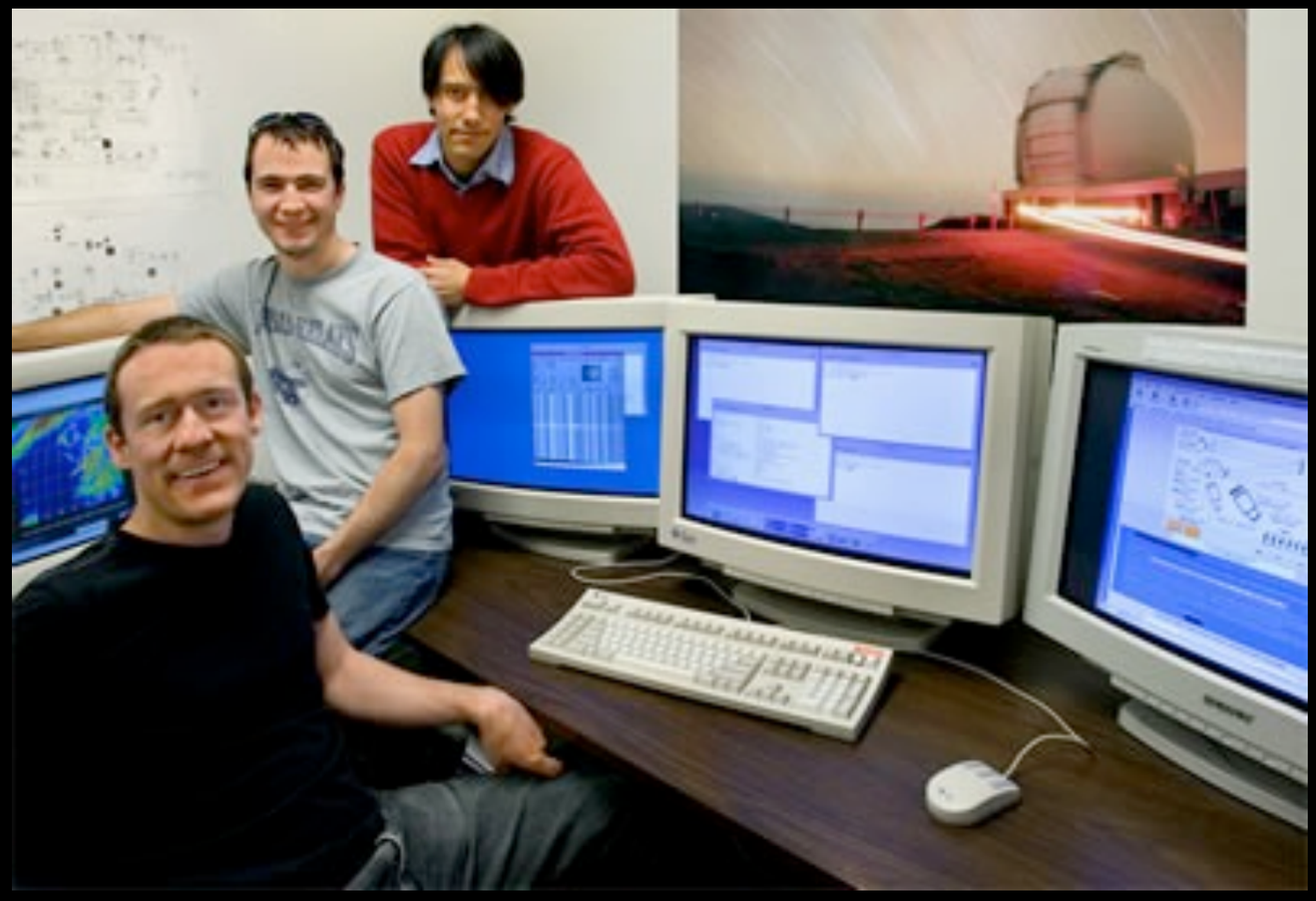


TDA at Keck: Technology



TDA at Keck: Technology

- Modifications to existing
  - Facilitate remote observing from ‘anywhere’
  - Keep a high percentage of instruments ‘hot’
    - ✦ Maintain calibrations
    - ✦ Equip with favored gratings, filters



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- Modifications to existing
  - Facilitate remote observing from ‘anywhere’
  - Keep a high percentage of instruments ‘hot’
    - Maintain calibrations
    - Equip with favored gratings, filters
- New avenues
  - Keck I deployable tertiary

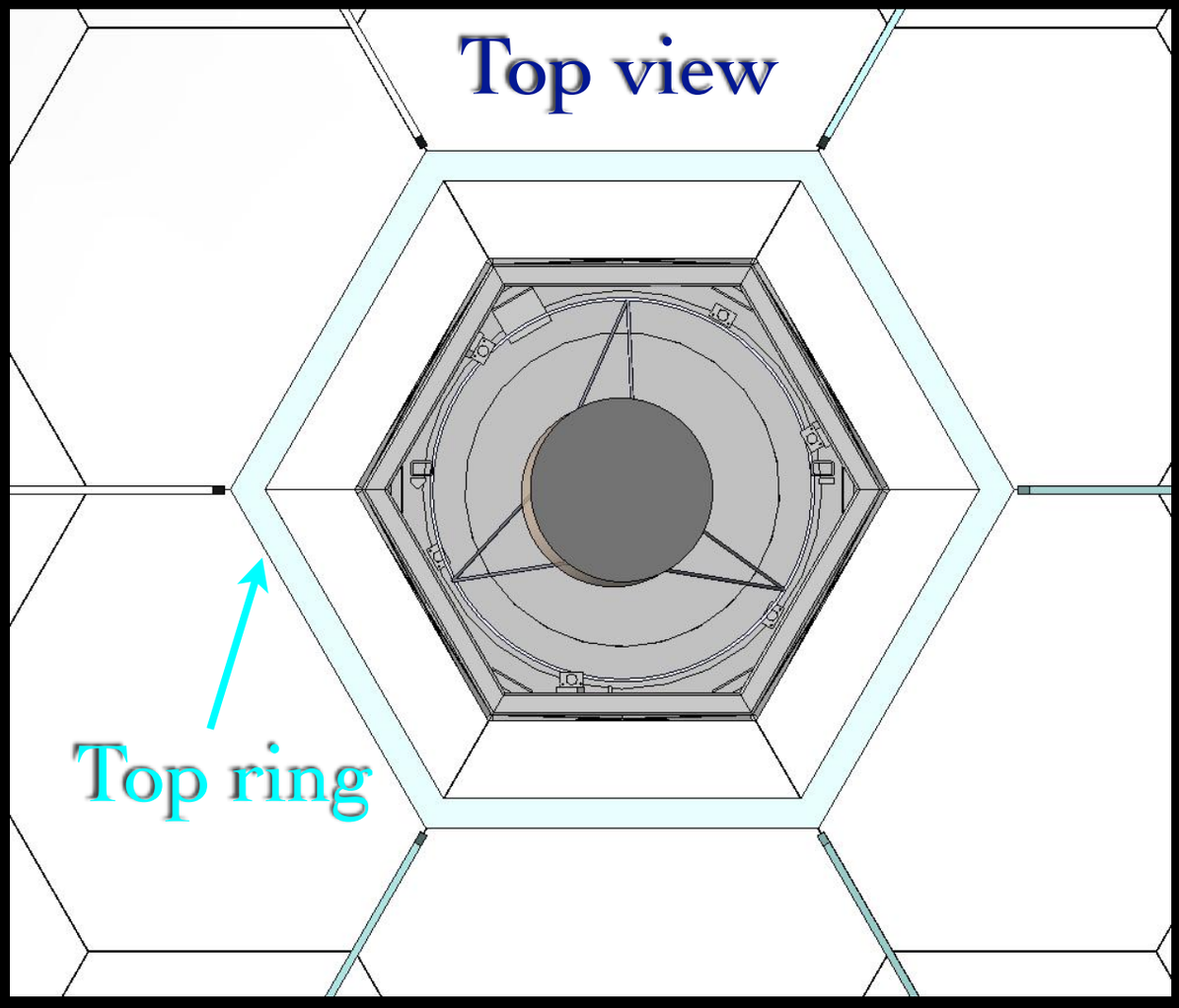
Keck I Deployable Tertiary

- Motivations
  - Enable ToO observations with any Keck I instrument
    - e.g. HIRES observations of bright GRBs
  - Enable flexible scheduling and high cadence observing
  - Eliminate manual tertiary changes
- Specifications
  1) When the tertiary is stowed, it should not block the Cassegrain instruments
  2) When deployed it should provide the full FOV of each Nasmyth instrument
  3) The tertiary can rotate
  4) Deployment/stowing should take less than 15min time

Current 'Team'

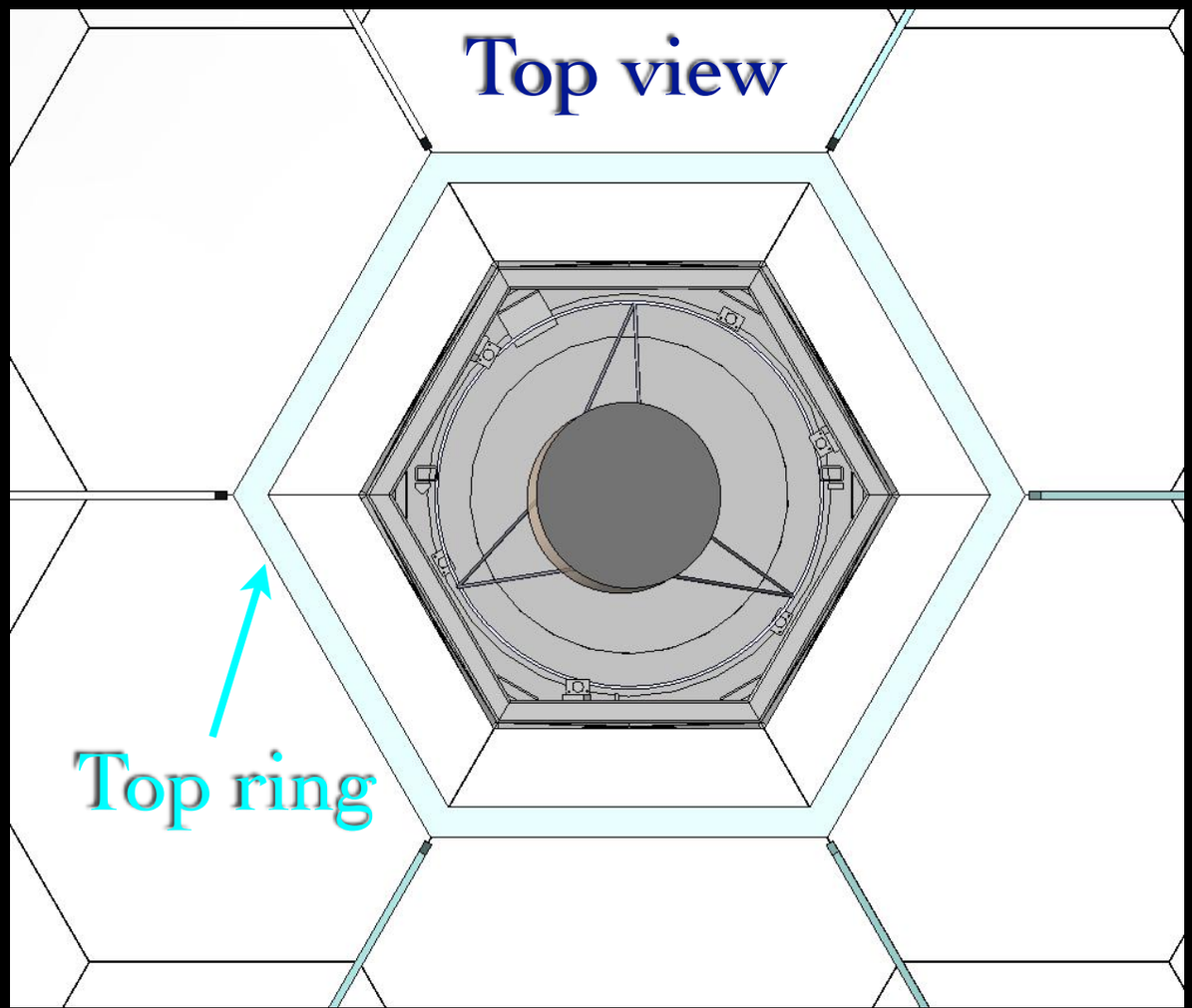
Harland Epps (UCO)
J. Xavier Prochaska (UCO)
Jerry Nelson (UCO)
Jerry Cabak (UCO)
Hilton Lewis (Keck)

Keck I DT: Conceptual Design



Keck I DT: Conceptual Design

- Mirror
  - 5arcmin FOV
  - Size
    - 0.88m major axis
    - 0.66m minor axis
  - Mass ~ 54.5 kg
  - 12 rear supports offering minimal deflection



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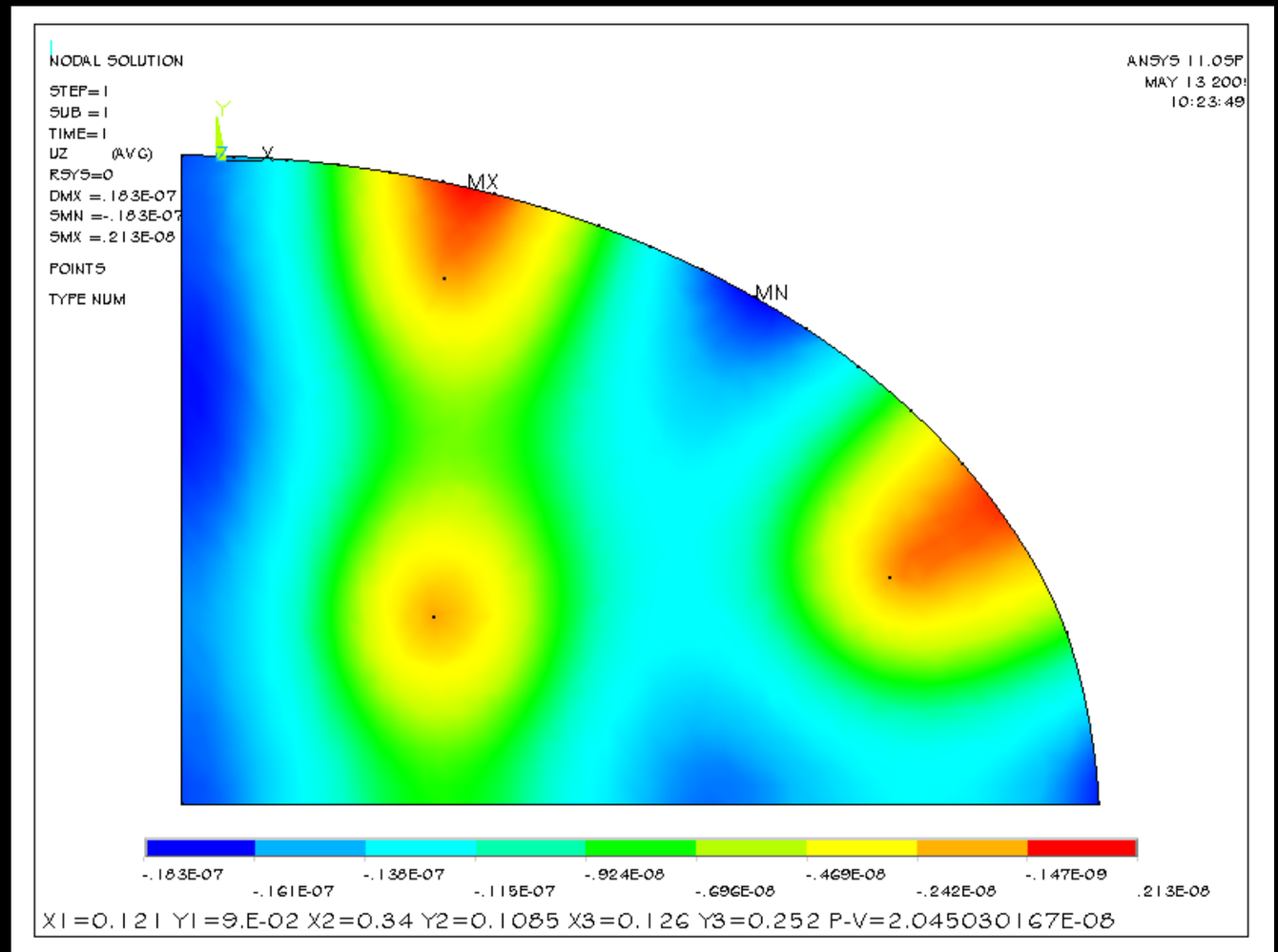

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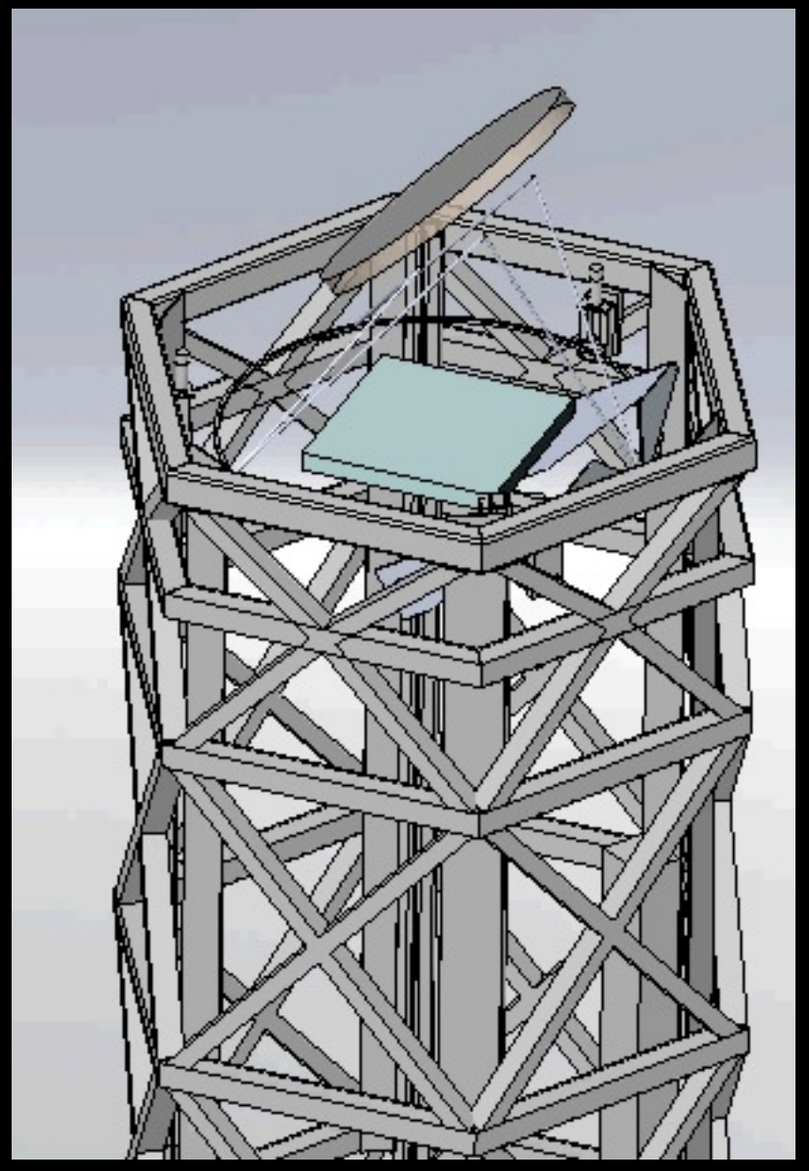
  - Six strut, kinematic support



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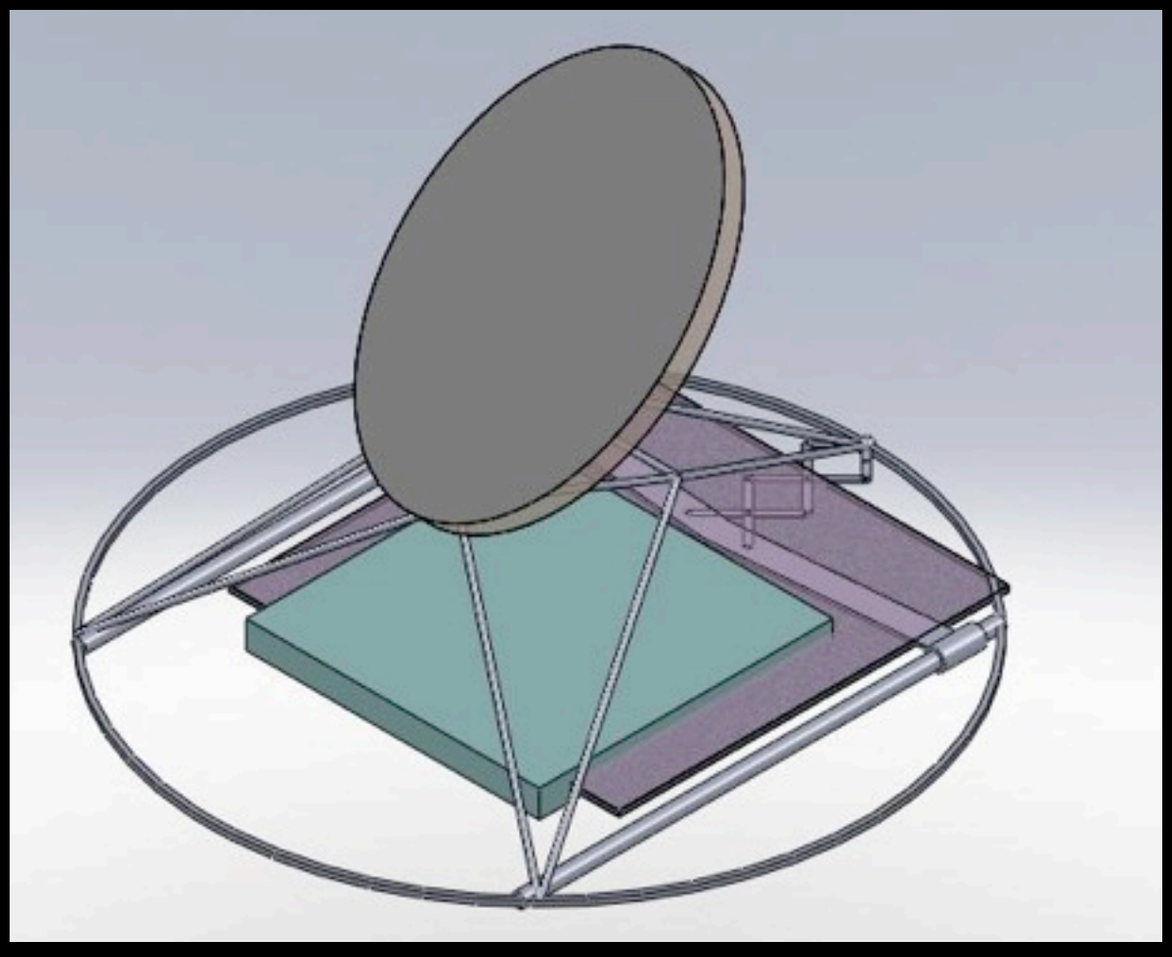
- Deployment mechanism
  - Not fully developed



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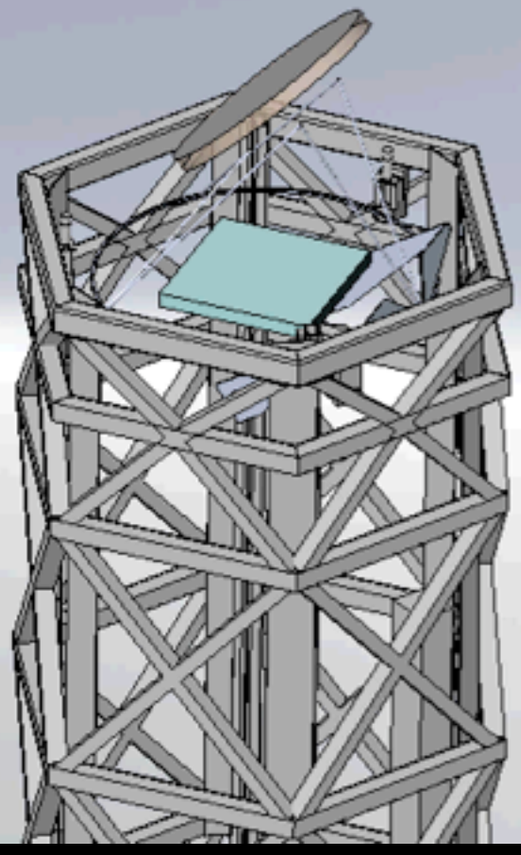

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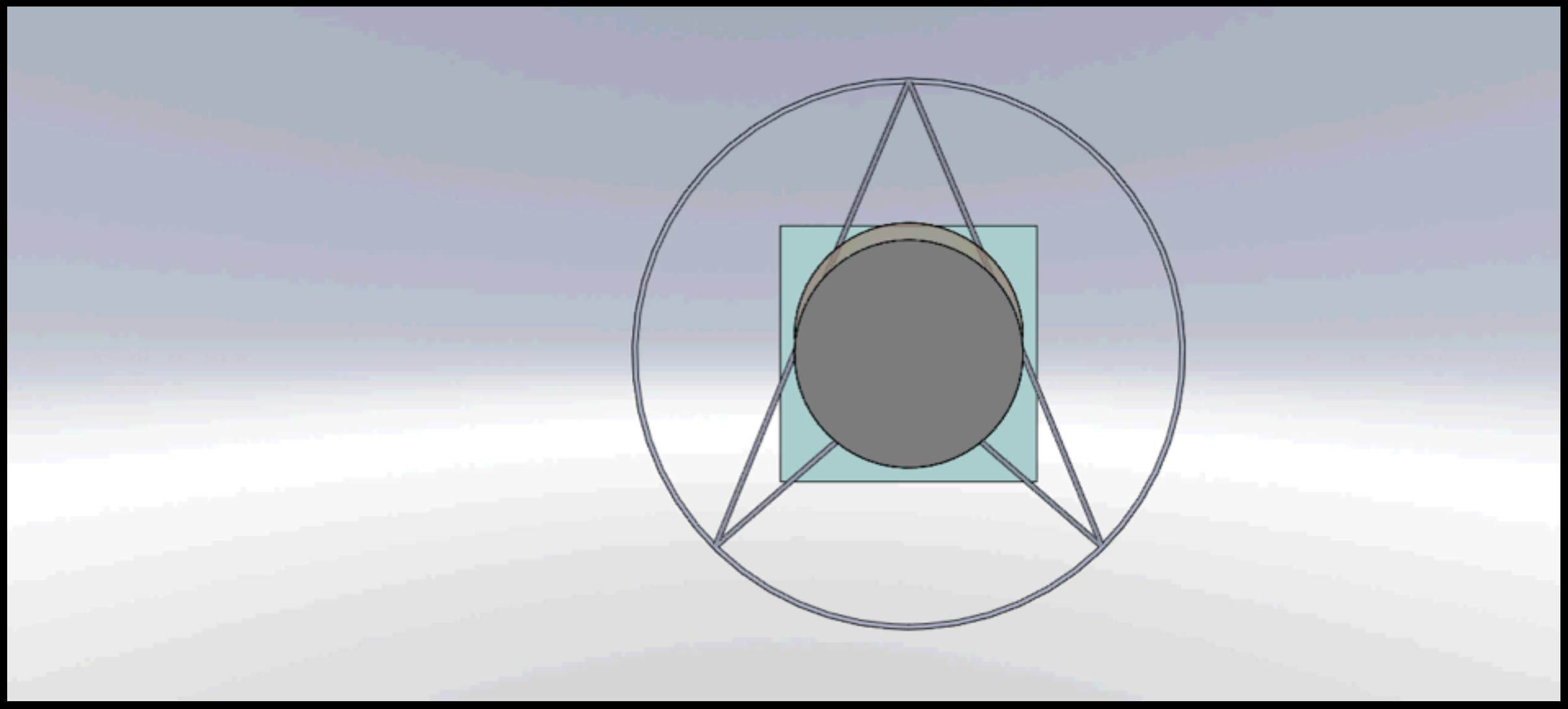

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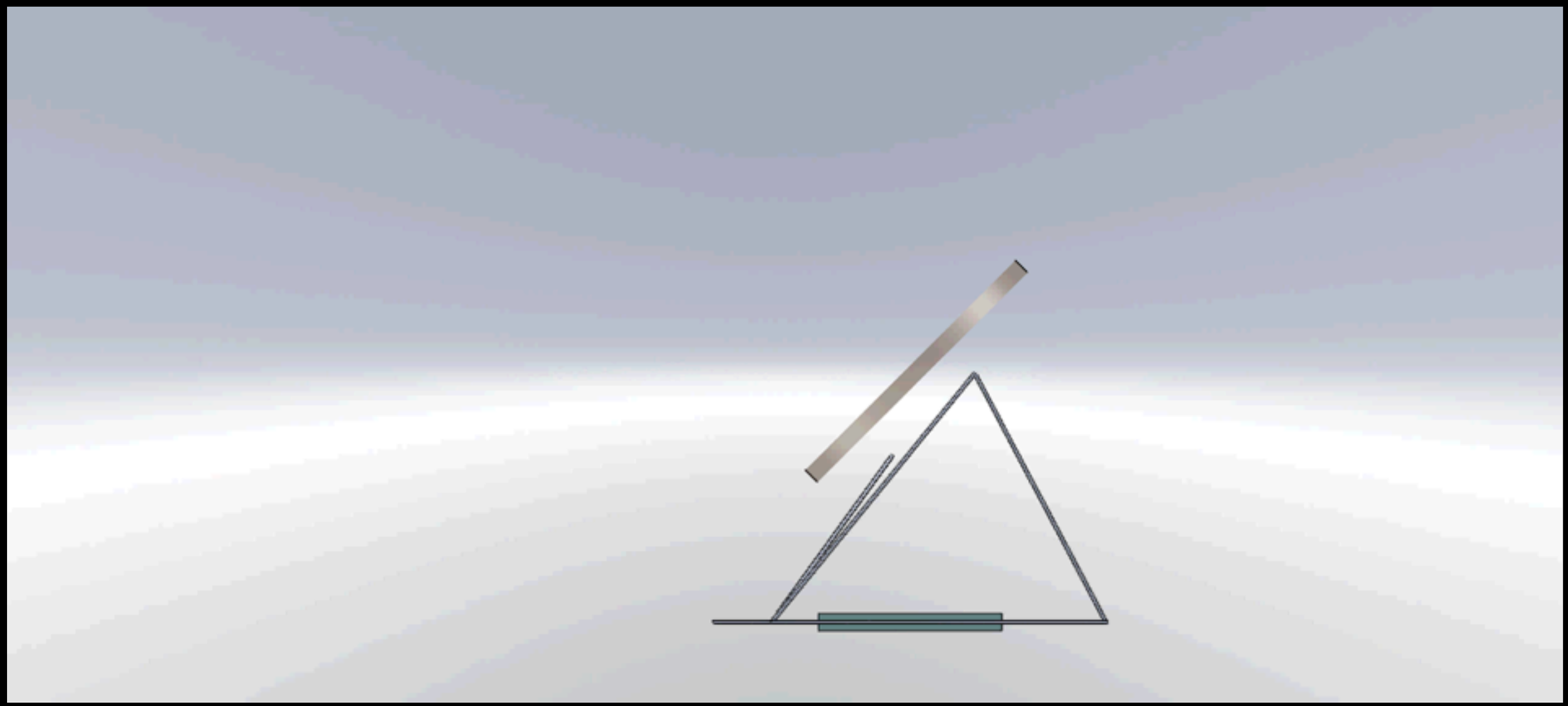
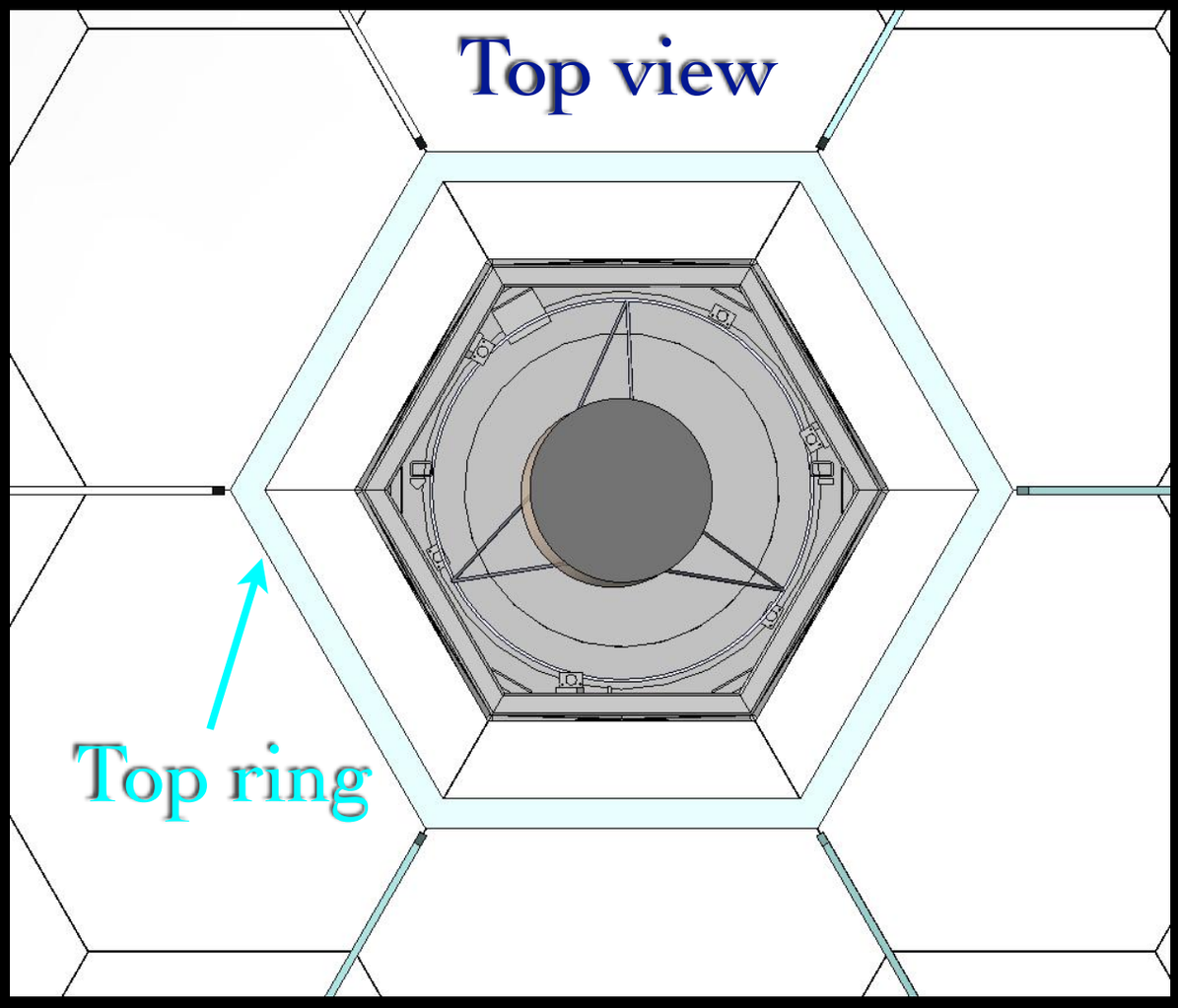


Keck I DT: Risks

- Installation
  - Significant engineering above the primary
    - ✦ No more complex than the ADC
  - What is the interruption to KI observing?
- Reliability
  - More moving pieces than the current tertiary
- Long-term
  - KI limited to instruments with 5’ FOV
    - ✦ Do not engineer in a manner that precludes the old tertiary

Keck I DT: Costs and Funding



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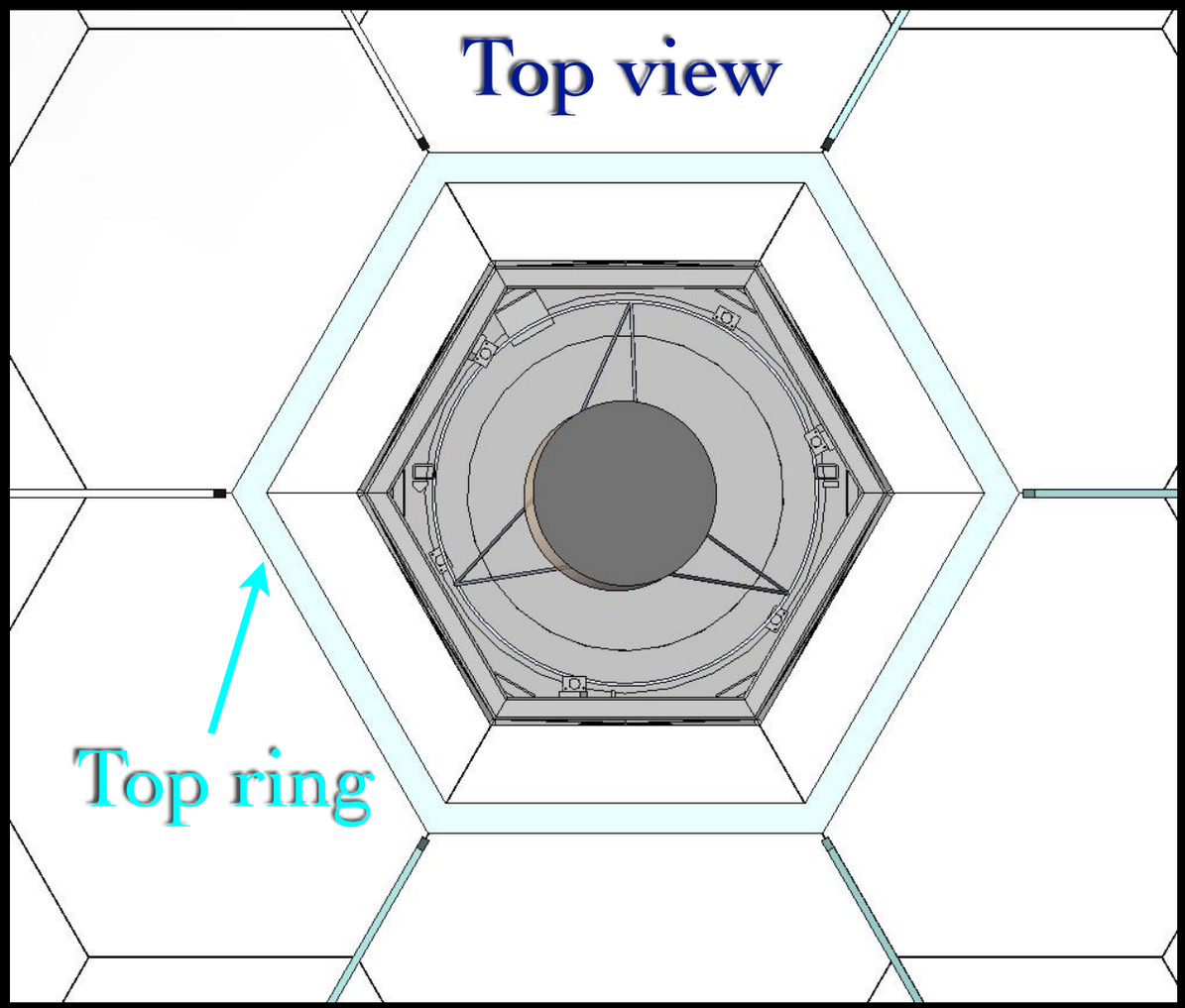
- Cost
  - No meaningful budget yet
    - Material costs, including the mirror, will be small (<100k)
    - Cost is driven by design+engineering
  - ROM: 100k - 1M
  - Plan
    - Develop a precise budget in <1month



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  - Plan
    - Develop a precise budget in <1month
- **Funding (if SSC approved)**
  - JN: "This is such a benefit to KO, it should be done today!"
  - Reality based: External funds
    - NSF/ATI: Due November 1, 2009
    - Future TSIP?
    - Special PDA program