SCT Proposal Status

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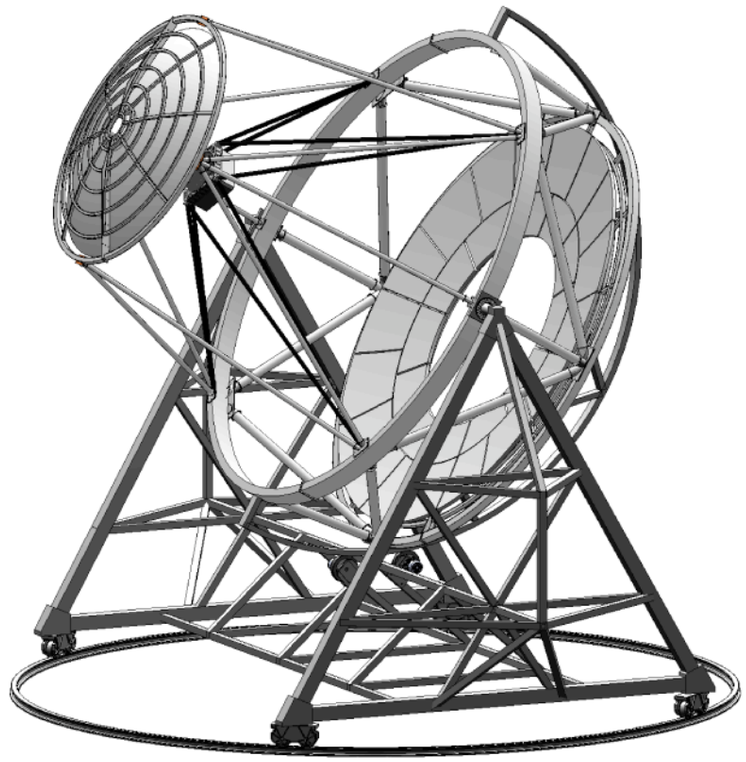
R&D Proposal

- Positive recommendation from Astro2010 paved the way for (yet another) R&D proposal
- Joint to NSF (both PHY and AST) and DOE.
- SLAC internal review in May 2011 –> better proposal
- Submitted to NSF on July 5, 2011
- Submitted to DOE as a Field Work Proposal by SLAC July 19, 2011 and by Argonne shortly thereafter.
- No decision yet from either agency.
- Still our best understanding of the required scope of work



Overall Plan

- CTA base line for southern array: 4 LSTs, 23 MSTs, 50 – 80 SSTs.
- Increase MST array to 59 telescopes to realize its full potential.
- Provide important additional science capabilities through high-resolution imaging, wide FoV operation combined with 1 km^2 area.
- Boost the 23 MST array with 36 MSTs that provide a better performance and/or are more cost-effective.
- Develop the SC-telescope to demonstrate its cost and performance.
- Complementary R&D to existing CTA PP phase and participate in the construction of the CTA MST array.
- Construction of MST array of either SC- or DC-telescopes.
- Delivery of US MSTs starts later than the European telescopes.

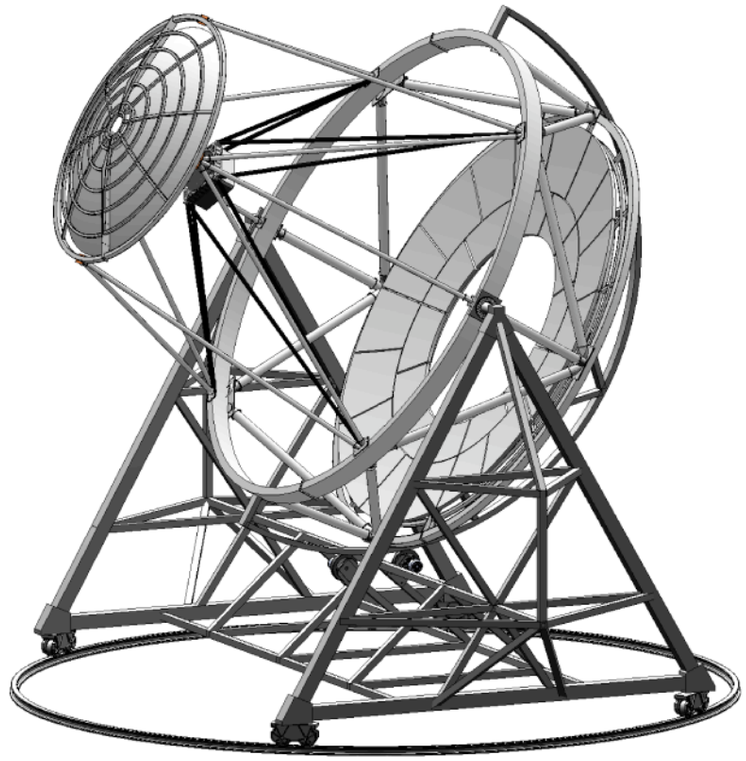
What does this add to CTA?

- R&D provides the potential of a cost-effective, novel telescope that is inherently a high-resolution, wide-field-of-view instrument.

- The addition of 36 MSTs brings a factor of ~3 better flux sensitivity, a much improved angular resolution (more telescopes view the shower), larger collection area, and improves the wide field of view capabilities of CTA.

- Angular resolution: resolve emission regions and perform morphological studies of galactic sources, putative dark matter sources and unidentified sources.

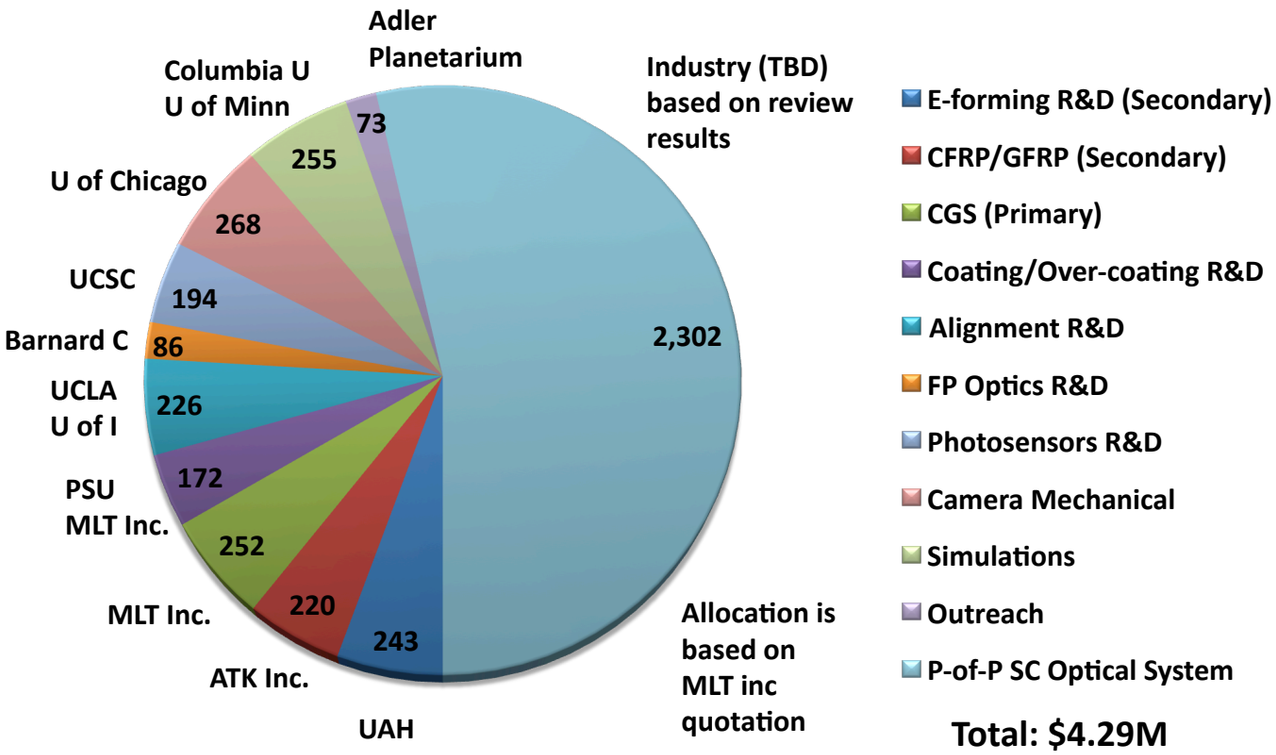
- Wide field of view: to detect transients & to improve array reconstruction while maximizing collection area of array



The R&D Effort

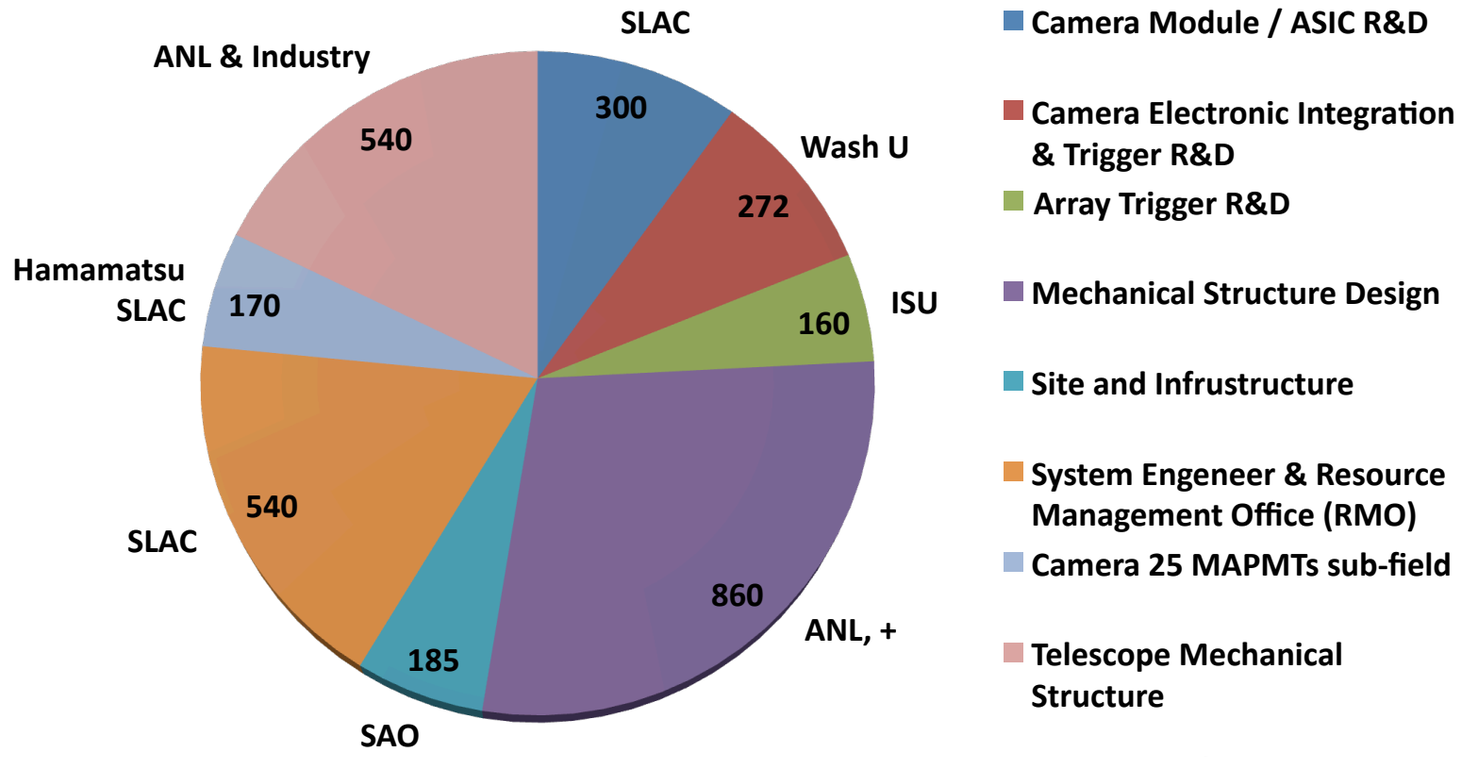
- First 2 years: Develop SC design
  - Simulations to optimize and assess improvements to angular resolution, background rejection, sensitivity
  - Develop and evaluate technologies
  - Optimize cost and performance
  - Decision of whether to proceed with proof-of-principle telescope
- Second 2 years: Build proof-of-principle telescope
  - Complete mechanical structure
  - Fabrication of mandrels for mirrors, mirror panels and alignment system
  - Partially (~15%) populated camera
  - Full test of proof-of-principle system; design & performance report
  - Decision on telescope design for contribution to MST array
- Cost, procurement & construction plan for MST array based on SC or DC telescopes

R&D Proposal Budget



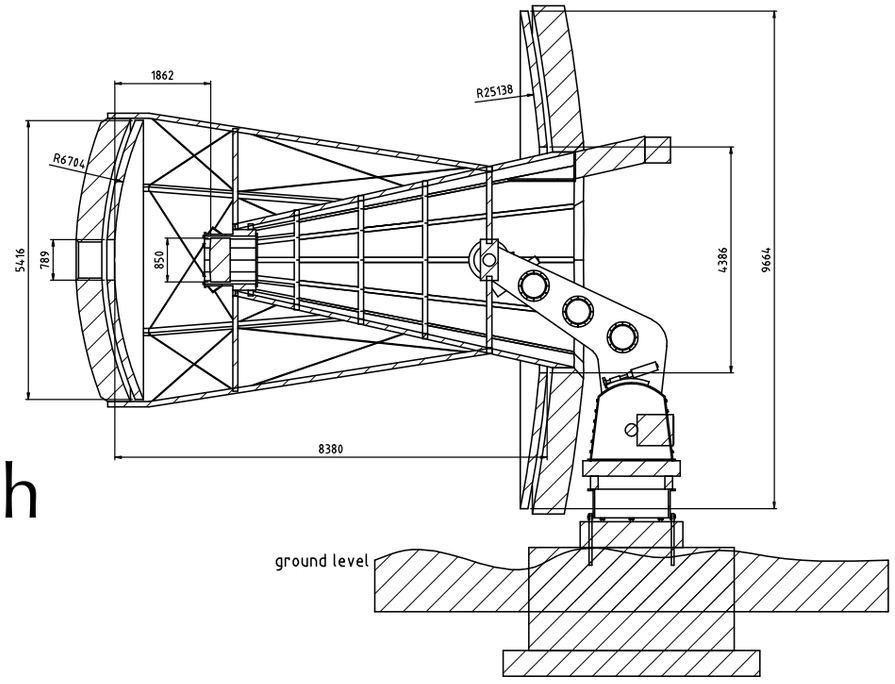
NSF — Optical system, simulations, and some aspects of camera

DOE — Mechanical structure, camera, and trigger



NSF MRI Proposal

- More constrained than a general proposal, but a different pot of money
  - Must build a scientific instrument
  - Strict 15-page limit
  - Cost sharing required for most institutions
  - Maximum $4M request from NSF
- Substantial, but far from complete, overlap with R&D proposal
- Need to proceed to construction with best available information
- Optimizing design would come later
- Submitted to NSF on January 26, 2012
- Expected start date would be August 1, 2012



MRI Budget and Scope

INSTITUTION	Year 1	Year 2	Year 3	NSF Budget	Cost Sharing	TOTAL	Comment
University of California Los Angeles	788,000	255,000	34,375	**1,077,375**	548,068	**1,625,443**	
Georgia Institute of Technology	29,594	35,598	14,994	**80,186**	34,366	**114,552**	
Iowa State University	57,200	21,850	73,000	**152,050**	39,450	**191,500**	Additional cost-sharing provided by UCLA
Smithsonian Astrophysical Observatory	4,473	58,029	77,498	**140,000**	0	**140,000**	Cost Sharing provided by UCLA
Stanford University	54,030	131,649	27,296	**212,975**	91,275	**304,250**	
University of California Santa Cruz	53,663	54,551	56,368	**164,582**	70,535	**235,117**	
University of Chicago	212,000	235,000	0	**447,000**	190,949	**637,949**	Additional cost-sharing provided by UCLA
University of Iowa	0	25,571	23,500	**49,071**	21,031	**70,102**	
University of Utah	0	7,001	34,999	**42,000**	18,000	**60,000**	
Washingon University	52,500	47,600	33,600	**133,700**	57,300	**191,000**	
Barnard College	155,949	535,317	78,734	**770,000**	0	**770,000**	Exempt from the cost-sharing requirement
Columbia University	109,000	69,998	10,002	**189,000**	81,000	**270,000**	
University of Alabama in Huntsville	171,404	121,340	77,534	**370,278**	158,690	**528,968**	
TOTAL	**1,687,813**	**1,598,504**	**541,900**	**3,828,217**	**1,310,664**	**5,138,881**	

- Full mechanical structure and optical support system
- Full primary mirror
- One ring of secondary mirror
- One ~2.8° “subfield” of camera; 5x5 modules; SiPM photosensors

NSF-AST Portfolio Review

Summary of our response:

- New Worlds, New Horizons identifies very high-energy (VHE) gamma-ray observations as a critical capability for a balanced national program in astronomy and astrophysics.
- Research in gamma-ray astrophysics has close connections to observations across the full electromagnetic spectrum and to “multi-messenger” observations of neutrinos, cosmic charged particles and gravitational waves and therefore contributes to the vitality of astronomy and astrophysics in the U.S. as a whole.
- The Cherenkov Telescope Array (CTA) delivers VHE gamma-ray capability consistent with the New Worlds, New Horizons recommendations.
- NSF-Astronomy helped lay the foundation for current success in VHE gamma-ray astrophysics with its investment in VERITAS in response to the previous decadal survey, and New Worlds, New Horizons recommends continued support for this area.
- Although CTA is a large-scale project overall, the New Worlds, New Horizons recommended participation for NSF-Astronomy in CTA is medium-scale.
- The international partnerships formed on the basis of the New Worlds, New Horizons report should be fostered.

DOE R&D Jumpstart

- CTA-US visit to DOE January 12, 2012
- DOE requested a modest request for the highest priority aspects of the SCT R&D
- Budget request is $1.05M compared to $1.73M for R&D Phase 1
- Being requested as part of the annual SLAC and ANL lab budget process with DOE

	Mechanical System (MS)	Electronics System (ES)	Management Support	Effort
Year 1	Develop conceptual design of the SC-telescope.	Develop a front-end readout design based on TARGET ASIC.		MS: 1 FTE at ANL for mechanical engineering. ES: 0.5 FTE at SLAC for electronics engineering.
Year 2	Deliver preliminary design & cost estimate for the SC-telescope. Review of telescope designs.	Test and evaluate ASIC and develop vertical integration including backplane and trigger. Review camera electronics.	Organize engineering review of SC-telescope concept and provide a WBS.	MS: 1 FTE for engineering. ES: 0.5 FTE (SLAC), 0.25 (WashU), 0.25 FTE (ISU) for ASIC, backplane & trigger (engineering and M&S).