

WBS	Name	M&S	M&S Notes	Labor	Labor Notes
1	Instrumentation				
1.1	PreCam Camera				
1.1.1	Design Dewar			1 FTE month	1 FTE month engineering (from ANL LDRD grant)
1.1.1.1	R&D				
1.1.1.2	Initial Design Complete				
1.1.1.3	Final Design Complete				
1.1.2	Procure Materials				
1.1.2.1	CCDs + Detector Mounts	\$0	Long-term loan from DECam?		
1.1.2.2	PreCam Imager Vessel/Dewar	\$5,000	ANL LDRD grant		
1.1.2.3	Vacuum Interface Board	\$1,000	FNAL?		
1.1.2.4	Cables and Connectors		Long-term loan or contribution from FNAL?		
1.1.2.5	Vacuum Pump	\$4,500	Non-ANL cost, if deployed to CTIO (Is it possible to use current vacuum pump already at Curtis-Schmidt?)		
1.1.2.6	Detector Controller (Monsoon?)		Long-term loan or contribution from FNAL?		
1.1.2.7	Temperature Control System	\$5,000	Non-ANL cost, if deployed to CTIO Three options for a temperature control system: (1) no temperature control system (\$0) (2) low-end hardware + a few weeks' engineering work (< \$500 materials) (3) Lakeshore controller (~\$5000)		
1.1.2.8	Data Acquisition Software		University of Michigan(?)	1 FTE month	1 FTE month engineer (CTIO?)
1.1.2.9	Data Acquisition Computer	\$2,000	University of Michigan(?)		
1.1.2.10	Dewar Window/Field Flatteners	\$5,000	TBD		
1.1.3	Construct Camera			1 FTE month?	1 FTE month(?) ANL machinist labor from ANL LDRD grant
1.1.3.1	Machine Focal Plate				
1.1.3.2	Machine Vacuum Vessel				
1.1.3.3	Machine LN2 Vessel				
1.1.3.4	Assemble Dewar				
1.1.4	Commission Camera				scientist labor
1.1.4.1	Test Dewar @ ANL				
1.1.4.2	Test Dewar @ FNAL				
1.1.4.3	Ship to CTIO	\$2,000	FNAL?		
1.1.4.4	Mount on UM Curtis-Schmidt				
1.1.4.5	Shakedown Tests on UM Curtis-Schmidt				
1.2	Filters (grizY)	\$20,000	Might just use the 4-in filters bought for the CTIO-1m runs.		
1.2.1	Prepare Filter RFI				
1.2.2	Order Filters				
1.2.3	Receive Filters				
1.2.4	Measure Filters @ Univ of Michigan			0.5 FTE month	0.5 FTE month student
1.3	Flat Field Screen and Illumination System	\$4,500	screen (\$0.5K), illum. sources (\$0.5K), control system (\$0.5K), travel (\$3K)	1 FTE month	
1.4	Folding Flat	\$6,500	mirror (\$2K), raw materials, (\$0.5K), machining (\$1K), travel (\$3K)	1 FTE month	0.5 FTE month mech engineer, 0.5 FTE month student
1.4.1	Design Folding Flat			1 FTE month	0.5 FTE month mech engineer, 0.5 FTE month student
1.4.2	Assemble and Test Folding Flat			1 FTE month	0.5 FTE month mech engineer, 0.5 FTE month student
2	Survey Strategy and Mountaintop Operations				
2.1	Survey Strategy				
2.1.1	PreCam Footprint in grizY			1 FTE month	1 FTE month scientist
2.1.1.1	Consult with SkyMapper Project				
2.1.1.2	Finalize Survey Strategy				
2.1.2	Observing Strategy Software (PreCam ObsTac)			1 FTE month	1 FTE month scientist
2.2	Mountaintop Operations	\$26,000	Curtis-Schmidt Operating Costs (\$5K/month) assuming 3 months operations		
2.2.1	Observing Runs		Costs for travel and CTIO room & board (\$3.5K/observer/fortnight)		
2.2.1.1	July or August 2010	\$24,500	4 observers for 1st fortnight, 3 observers/ for second fortnight (total: 4 weeks)	3.5 FTE months	3.5 FTE months scientist/students
2.2.1.2	Dec 2010/Jan 2011	\$42,000	3 observers/fortnight for 8 weeks	6 FTE months	6 FTE months scientist/students
3	Data Processing and Analysis				
3.1	Data Processing Pipeline Development				
3.1.1	Image De-trending (IRAF, pyraf, or DESDM pipeline)			3 FTE months	3 FTE months scientist
3.1.1.1	Cross-talk correction				
3.1.1.2	Bias Subtraction				
3.1.1.3	Flat fielding				
3.1.2	Cataloging			3 FTE months	3 FTE months scientist
3.1.2.1	Object Detection (SExtractor?)				
3.1.2.2	Astrometry (SCAMP?)				
3.1.3	Photometric Calibration			3 FTE months	3 FTE months scientist
3.1.3.1	Star-Flat Correction (GCM-StarFlat)				
3.1.3.2	Nightly Calibration (PSM-lite)				
3.1.3.3	Global Relative Calibration (GCM-ZP solver)				
3.1.3.4	Global Absolute Calibration (synphot?)				
3.1.4	Grid Orchestration			2 FTE months	2 FTE months computing professional
3.2	Data Processing Operations (Running the Pipeline)	\$4,000	4 TB of disk space and ancillary computing equipment		
3.2.1	Campaign 1 (post Jan 2010)			1 FTE month	1 FTE month scientist
3.2.2	Campaign 2 (post Aug 2010)			1 FTE month	1 FTE month scientist
3.2.3	Campaign 3 (post Jan 2011)			1 FTE month	1 FTE month scientist
3.3	Data Analysis				
3.3.1	Transformation Equations			1 FTE month	1 FTE month scientist
3.3.1.1	SDSS-DES				
3.3.1.2	SkyMapper-DES				
3.3.2	Calibrator Stars and/or Y-band Standards			3 FTE months	3 FTE months scientist
3.3.3	Final Catalog			3 FTE months	3 FTE months scientist
3.3.4	Candidate White Dwarf Search			1 FTE month	1 FTE month scientist
4	PreCam Management				
4.1	Prepare Science Case for PreCam				
4.2	Present Science Case to DES Science Committee				
4.3	Receive Decision from Science Committee				
4.4	Prepare MOU for use of UM Curtis-Schmidt				
4.5	Sign MOU for use of UM Curtis-Schmidt				
4.6	Procure Funding for PreCam Survey				
TOTAL		152000			