

## LOI for Site conceptual design studies for CMB-S4

**Introduction:** The CMB-S4 reference design includes telescopes in two sites, the South Pole and the Atacama Desert in Northern Chile. Both of these sites are already developed but will require significant upgrades to support CMB-S4. Some of the site work will need to start early and is likely to be included in the scope for CD-3a approval. We propose to carry out conceptual design and engineering studies to: (a) identify and carry out critical trade studies, especially as concerns power generation, data transmission and specific siting decisions (b) develop conceptual designs for long-lead infrastructure and refine the cost and schedule estimates, and (c) where necessary and possible, begin detailed engineering designs to advance time-critical infrastructure. This work will begin in FY19 and will likely extend until CD-1/3a.

**Participating Institutions:** The institutions involved in this LOI are the University of California, San Diego (Kam Arnold), Lawrence Berkeley National Laboratory (Natalie Roe), and Fermi National Accelerator Laboratory (Brad Benson). University personnel with appropriate expertise will be also be included in this effort via sub-award(s).

The 3-year work plan is summarized below, with the goals for years 2 and 3 in italics.

**Goal 1:** Quantify power requirements for both sites and carry out trade studies for each site on power generation systems that can satisfy site requirements. *Develop a conceptual design for the power system and a preliminary cost and schedule. Begin the detailed engineering design, refine the cost and schedule in preparation for CD-3a approval.*

**Goal 2:** Quantify data transmission requirements for both sites and carry out trade studies for each site on systems that can satisfy site requirements. *Develop a conceptual design for the data transmission system and a preliminary cost and schedule. Begin the detailed engineering design, refine the cost and schedule in preparation for CD-3a approval.*

**Goal 3:** Quantify civil construction requirements for both sites and carry out trade studies for each site for support buildings, high-bay and clean laboratory space, and recommend concepts that can satisfy site requirements. *Develop a conceptual design for the civil construction and a preliminary cost and schedule. Begin the detailed engineering design, refine the cost and schedule in preparation for CD-3a approval.*

**Goal 4:** Carry out a trade study comparing different sites in Chile, and different siting locations at the South Pole and develop a recommendation ranking the possible locations at each site.

**Resources requested:** The requested resources for the first year are 0.5 FTE of engineering for each site, for a total of 1 FTE, plus a travel budget to support visits to the sites and to attend reviews.

**Relevant Existing Effort:** Kam Arnold at UC San Diego is the site lead for Simons Observatory, has extensive experience deploying to Chile, and has Chilean diplomatic credentials. Brad Benson at FNAL has deployed to the South Pole ten times, and for the SPT-3G experiment was the WBS lead for the SPT-3G camera integration and deployment, and Site operation