Memorandum of Understanding
Between
The Dark Energy Survey Collaboration
And the
South Pole Telescope Collaboration

10 April 2012
Version 5

I. Introduction

This Memorandum of Understanding describes the mutual agreement that the Dark Energy Survey (DES) and South Pole Telescope (SPT) collaborations have reached in order to carry out joint science analyses using their data sets. The aim of this MOU is to foster and lay out the guidelines for such joint efforts, in order to enhance the science output of both projects. The duration of the MOU is ten years from the date that it has been adopted by senior management of both collaborations. The collaborations may choose to extend the MOU or to alter its terms by amending it if both agree. They may also shorten the duration of it (including immediately terminating it) at the behest of the management of either collaboration. This MOU does not preclude these collaborations from separately entering into agreements or understandings with other projects.

II. The Collaborations

The core institutions of the South Pole Telescope-SZ (SPT-SZ) Survey collaboration include the University of Chicago (UC), the University of California, Berkeley, Case Western Reserve University, the Harvard-Smithsonian Center for Astrophysics, McGill University, the University of Colorado at Boulder, the University of California, Davis, and the Universitats-Sternwachte Munchen of Ludwig-Maximilian University (USM). The Principle Investigator of the SPT project is John Carlstrom (UC). The SPT was constructed to carry out observations of the cosmic microwave background (CMB), including Sunyaev-Zel'dovich (SZ) effect observations of galaxy clusters, measurement of small-scale CMB anisotropy, and measurement of CMB polarization. It has been operating at the South Pole since early 2007. As part of its program, the SPT collaboration is carrying out an SZ survey covering several thousand square degrees in the south Galactic cap, with the aim of measuring the evolution of the abundance of clusters and thereby probing the nature of dark energy and other cosmological parameters.

The Dark Energy Survey collaboration comprises scientists from Fermilab, University of Illinois at Urbana-Champaign, the University of Chicago, Lawrence Berkeley National Laboratory, the National Optical Astronomy Observatory, the National Center for Supercomputer Applications, the Spain DES consortium (Instituto de Ciencias del Espacio, Institut de Fisica d'Altes Energies, and Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas), the United Kingdom DES consortium (University College London, the University of Portsmouth, the University of Cambridge, the University of Edinburgh, the University of Sussex, the University of Nottingham), the University of Michigan, the DES Brazil consortium (Observatorio Nacional, Centro Brasileiro de Pesquisas Fisicas, Universidade Federal do Rio Grande do Sul), the University of Pennsylvania, Argonne National Laboratory, the Ohio State University, the South Bay Consortium (University of California at Santa Cruz, SLAC National Laboratory, Stanford University), Texas A&M University, and USM. The DES collaboration is managed by the DES Management Committee; the Chair of the

Management Committee is Josh Frieman, the Project Director, who reports to the DES Council and the DOE-NSF Joint Oversight Group. The scientific work of the collaboration is managed by the DES Science Committee, which comprises the coordinators of the Science Working Groups and a chair or co-chairs. DES policy documents relevant to this MOU include the DES Membership Policy, the DES Publication Policy, and the Science Committee Charter.

The DES collaboration is constructing a new wide-field optical imaging instrument for the Blanco 4-meter telescope at Cerro Tololo InterAmerican Observatory (CTIO) in Chile, developing an associated data management system, writing science analysis pipelines, and upgrading the telescope facility. The primary scientific aim of the DES is to probe dark energy through galaxy clusters, weak lensing, large-scale structure, and supernovae. Dark Energy Survey operations at CTIO are scheduled to begin in late 2012 and to cover 525 nights, ending in 2017. The bulk of the DES observing time will be devoted to a multi-band survey covering approximately five thousand square degrees.

III. Rationale

By design, the DES and SPT survey regions will include several thousand square degrees in common, and they provide complementary information on galaxy clusters. The SPT data will be used, in part, to identify clusters via the SZ effect. The SZ flux decrement is strongly correlated with cluster mass, which is useful for deriving precise cosmological constraints from the cluster abundance. Since SZ flux is relatively insensitive to cluster redshift, other observations are needed to estimate cluster redshifts. The DES data will be used, in part, to identify clusters as optical concentrations of red galaxies. The multi-band optical data of cluster galaxies will yield accurate photometric redshift estimates of the clusters. The DES data on clusters can be stacked to provide statistical weak lensing mass calibration as a function of cluster observable (e.g., SZ flux decrement or richness). The DES data will also be of great value in quantifying the contamination and completeness of the SPT SZ cluster catalog at low SZ signal-to-noise. These synergies and complementarities are the primary motivation for carrying out joint analyses of the SPT and DES data sets, but they do not exhaust the possibilities.

IV. Principles of Agreement

The two collaborations agree on the following principles that will guide their joint efforts:

1. The collaborations will pursue joint analyses of SPT and DES data where they overlap. These analyses will be pursued collaboratively and will be open to all members of the DES and SPT collaborations. For DES, this includes members, associate members, and approved participants (students and postdocs), as defined by the DES Membership Policy.

2. Joint analyses are those that are based upon *both* SPT and DES data. Science analyses that involve only SPT or only DES data are not subject to this MOU.

3. When a joint analysis project is being planned, each collaboration will identify one or two collaboration members who will act as primary liaisons for that project with the liaisons of the other collaboration. The liaisons and those initiating the joint project (who may be the same) will draft a joint project announcement, laying out the goals of the project, listing those initially involved or interested in the project, inviting others to participate, outlining expected publications and results, specifying which data from each collaboration will be included, and giving expected timeline to completion. These announcements shall be circulated electronically to the members of both collaborations. On the DES side, the announcements should be vetted by the relevant Working Group coordinators and the Science Committee and will be made part of the DES project announcement archive. The list of joint analysis project members should be updated as it evolves and should be communicated to both collaborations.

4. On the DES side, joint analyses with SPT will be coordinated by the relevant Working Groups and overseen by the Science Committee, with regular reports/updates to the DES Management Committee. The Science Committee and/or the Management Committee may request revisions or clarifications in the joint project announcements, and Management Committee approval of the scope and list of participants (including all students and postdocs) will be required for the project to proceed. Approval of senior leadership of SPT will also be required for joint projects.

5. To facilitate these efforts, the liaisons should strive to maintain open communication between the joint analysis project members in the respective collaborations, through regular meetings, email communication, technical notes, etc. On the DES side, this could include inviting analysis project members from SPT to participate in relevant DES Working Group meetings. Regular updates on all joint analysis projects and preliminary results shall be provided to the relevant DES Working Groups.

6. DES data access may be granted to joint analysis project members from the SPT collaboration. That access will be solely for the purpose of carrying out the approved joint analysis project. In this respect, SPT members in the joint analysis project will have the rights and responsibilities of External Collaborators, as defined by the DES Membership Policy. The SPT collaboration may reciprocally provide access to non-public SPT data to members of the DES collaboration involved in the joint analysis, with identical conditions and restrictions to those above. Those granted access to data from a collaboration of which

they are not members agree to abide by all collaboration rules regarding such data and in particular agree not to disseminate such data outside the joint analysis team or outside the collaborations. They also agree to use such data only for the joint analysis.

7. The communication and publication of joint SPT-DES results are subject to the publication policies and guidelines of both collaborations. On the DES side, this implies that joint publications are subject to the DES publication procedures, including internal review by an editorial review committee prior to release of results or publications, as well as to DES authorship inclusion and authorship ordering rules. Resulting joint publications will also be subject to the publication guidelines of the SPT collaboration. In cases where those policies may not be in agreement, the lead authors will work with the scientific and management leadership of the two projects to arrive at a mutually agreed resolution. Those participating in joint analysis projects agree to read and abide by any publication policies of the other collaboration.

8. According to the DES Publication Policy, certain categories of talks and presentations of DES results are managed by the DES Speakers' Bureau. When it comes to presentations of joint SPT-DES results, the DES Speakers' Bureau will coordinate with SPT management to ensure fairness and balance in representation between the collaborations.

9. Any disputes between joint analysis project members shall be brought to the science and senior management of both collaborations for resolution. Any issues arising from potential conflicts between the policies of the two collaborations shall also be brought to the science and senior management of the collaborations for resolution.

John Carlstrom, Principal Investigator, South Pole Telescope Date

Joshua Frieman, Dark Energy Survey Director Date