**Section 7: Overview of the LSST Dark Energy Program at Arizona: Elliott Cheu and Kenneth Johns**

Driven by the enormous physics potential in the area of dark energy (DE) and our desire to increase the physics breadth of the University of Arizona (UA) experimental high energy physics group, we propose to pursue DE research and camera-building responsibilities related to the LSST (Large Synoptic Survey Telescope). In 2010, the Astronomy and Astrophysics Decadal Study selected the LSST as the top priority for large, ground-based telescopes. With support from the UA College of Science, we initiated an LSST-based research program and developed a focused plan for the next years that aligns with the Dark Energy Science Collaboration (DESC) priorities within the LSST. We intend to actively interact with other experts at UA found at NOAO, the Astronomy Department and the Steward Observatory Mirror Laboratory. This proposal seeks the start of funding under the Cosmic Frontier to pursue dark energy science with the LSST within the UA experimental high energy physics group.

Table 1-1 shows the personnel in the UA high energy physics group to be supported by the DOE-HEP University program under the Cosmic Frontier task. If funded, we expect the FTE of Cheu and Johns to modestly increase by the end of three years.

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| **Position** | **Name** | **LSST** | **ATLAS** | **FTE Months on Research** | **# Months to be Funded by DOE for LSST Task** |
| Faculty | Elliott Cheu | 50% | 50% | 6 | 1 |
|  | Kenneth Johns | 20% | 80% | 6 | 0.4 |
| Postdoc | Alex Abate | 100% |  | 12 | 12 |
| Tech (Software) | Charlie Armijo | 50% | 50% | 6 | 3 |

Table 1-1. UA personnel to be supported by the DOE-HEP University program.

Table 1-2 below shows additional personnel in the UA high energy physics group engaged in the LSST effort but not supported by the DOE-HEP University program. These personnel are supported by the University of Arizona.

Our proposal is to understand and place constraints on dark energy using weak gravitational lensing of galaxies in the huge LSST dataset. The weak lensing technique is sensitive to dark energy through its effect on the expansion of the universe and the growth of structure. The DETF (Dark Energy Task Force) identified weak gravitational lensing as potentially the most powerful probe of dark energy within a Stage-IV survey such as the LSST, as long as the control and mitigation of systematic errors is achieved to a new level. This is exactly what our planned research will address.

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| **Position** | **Name** | **LSST** | **ATLAS** | **FTE Months on Research** | **# Months Supported by non-DOE sources** |
| Postdoc | TBD | 100% |  | 12 | 12 (U.Arizona) |
| Engineer | Dan Tompkins | 50% | 50% | 12 | 12 (U.Arizona) |

Table 1-2. UA personnel supported by the University of Arizona.

We have identified a number of critical areas and problems related to the lensing measurement from galaxy images and dealing with uncertain radial information (photometric redshifts (z’s)). It is vital that they are attacked now in order to be truly ready for first light of the LSST. Primarily these areas include minimization and characterization of photometric-z errors and specification of object deblending requirements. Along with our physics effort, we also hold responsibilities to design power supplies for the LSST camera and to develop the associated control software.

Our proposed research aligns with work already in progress by us at UA as well as with the priorities of the recently formed DESC. The goal of DESC within the LSST is to coordinate the wide range of work that must be carried out to achieve the most sensitive constraints on dark energy possible. We are founding members of DESC and contributed to its initial White Paper. Some of the most important near term tasks prioritized in the White Paper will be investigated by us through our proposed work.

With no DOE funding for LSST science, we nevertheless established the groundwork for our LSST program in the last year through the restricted efforts of Cheu and Johns and full time effort of a University-supported postdoc, Alex Abate. Matching support for an LSST postdoc will likely continue for the near term. Our LSST program has the full support of both the College of Science and Physics Department.

As mentioned, our proposed research can draw on manifold areas of expertise already at the UA. These include NOAO and the Steward Observatory Mirror Lab, primarily but not exclusively focused on telescope building, and the Astronomy Department, where several faculty members including the new head of the Steward Observatory, have expressed interest in collaborating on LSST science. Many NOAO and Steward Observatory personnel are LSST members with expertise in related areas such as operations simulation and data management.

We seek to establish a dark energy physics effort in the UA High Energy Physics group funded through the Cosmic Frontier task. Our proposed research is good science, aligns with DESC near-term priorities, is supported by the UA and takes advantage of other entities pursing LSST science or telescope building on the UA campus.