1. NAME: SDSS-II (Sloan Digital Sky Survey Extension)

List of major collaborating institutions (including non-US partners).

University of Chicago
Fermilab
Japanese Participation Group
Johns Hopkins University
Los Alamos National Lab
Max Planck Institute for Astronomy - Heidelberg
Max Planck Institute for Astrophysics - Garching
New Mexico State University
University of Pittsburgh
Princeton University
United States Naval Observatory
University of Washington
Korean Scientist Group
University of Cambridge
Astrophysical Institute Potsdam
Joint Institute for Nuclear Astrophysics
American Museum of Natural History

2. SCIENTIFIC GOALS:

Physics goals. How does it fit into the global physics goals for the entire field.

SDSS-II is a continuation of the original Sloan Digital Sky Survey project (SDSS), which is scheduled to end in 2005. The Sloan Digital Sky Survey is a dedicated end-to-end self-contained facility designed to produce an extensive archive of data of the highest possible quality, which can be used both to answer some of the most interesting and important questions facing astronomy today, and to support exploration and definition of new ideas by the entire community. By mid-2005, the SDSS will have produced an imaging survey in five photometric bands covering 7700 square degrees of high-latitude sky, and a spectroscopic survey containing more than 600,000 galaxy spectra and 80,000 quasar spectra. We propose to continue to use the facilities developed for this purpose for what they are designed to do: to carry out massive, systematic surveys driven by fundamental questions.

The scientific goals and design of the SDSS focused on extragalactic themes, including the large-scale structure seen in the distribution of galaxies over very large volumes; a detailed characterization of galaxy properties and how these depend on galaxy clustering; and properties of quasars and their evolution. While the SDSS was designed to carry out cosmological investigations, it was recognized that the excellent quality and enormous volume of the data produced by its systems would support a vast number of other scientific programs, and so it has turned out. In particular, SDSS has supported great progress in two other important areas, Galactic structure and time-domain studies. The present proposal is to use the SDSS facilities to develop the areas of cosmology, galaxy formation and the exploration of dark energy, and to do so with an observing strategy that will assure adequate completion in the proposed three year duration of this extended project, SDSS-II.

The science goals of SDSS-II include a combination of programs: a new systematic

study of the stellar density, chemical, age and kinematic distributions in the halo and disk(s) of the Milky Way Galaxy (SEGUE); continued work on the large scale structure of the Universe, now aimed at constructing the largest possible single survey volume (Legacy); and a survey to determine Type Ia supernova light curves with five-band photometry, which will provide an important constraint on the rate of expansion of the Universe in the redshift interval $0.1 < z < 0.3$. Because of the complementary nature of these programs in their demands for observing time, their combination maximizes the effective exploitation of the facilities at APO. The programs also complement one another in terms of common overarching scientific goals and common efforts to maximize the data quality in support of those goals.

3. VALIDATION FOR SCIENTIFIC JUSTIFICATION:

Examples of recommendations and supporting statements from the committees, panels, and the community at large.

Hesser review of the SEGUE science:

The broad themes underlying SEGUE constitute a bold scientific vision linking the unique potential of the Milky Way galaxy to illuminate the formation and evolution of galaxies to forefront cosmology. In a very real sense, SEGUE could complete a quest begun by Carolyn and John Herschel two centuries ago to map our galaxy. SEGUE¹s team of world experts have devised a well-conceived plan to use the SDSS system to chart Galactic sub structures at $|b|>8$ degrees.

4. DESIRED SCHEDULE:

List major milestones (month & year) such as design complete, construction start, construction complete, etc.

Since this is a continuation of an existing program, there is no schedule for construction. The start date for data collection is July 1, 2005 and the end date is June 30, 2008.

5. ROUGH ESTIMATE OF COST RANGES:

Whatever the best information available (eg. $M +/-30~50%, $150~250M, etc.). Total cost range including non-DOE funding (if any other funding sources are assumed and if known, state from where and how much. Also indicate remaining R&D cost to go.

The budget is $14.9 million. The anticipated funding sources are NSF: $5.4 million, Sloan Foundation: $5.4 million, cash contributions by participating institutions: $2.5 million, in-kind contributions from participating institutions: $1.6 million.

6. DESIRED NEAR TERM R&D:

Major activities needed to be completed before start construction.

Hardware: none. The only significant change to existing hardware systems is an overhaul of the data acquisition system, which will be done in 2005.

Software: Development of supernova detection algorithms.

7. BRIEF DESCRIPTION OF LABORATORY'S ANTICIPATED ROLE:

Expected unique capabilities to be provided by lab. Rough estimate of human resources from lab (#FTE in what type labor).

Fermilab will contribute to SDSS-II in the following areas:

Project management and leadership
Technical support at the Apache Point Observatory in New Mexico
Oversee the data acquisition system upgrade
Work with other collaboration members on the development of the supernova detection pipelines
Coordinate survey observing plans
Deliver plugplate designs
Conduct data processing operations
Distribute data to the astronomical community
Participate in the science analyses of the data.

The activities will be supported through the Experimental Astrophysics Group (EAG) in the Computing Divison and the Technical Centers and the Theoretical Astrophysics Group in the Particle Physics Division,

The expected resources are:
4 FTE scientists
6.1 FTE Computing Professional, technical and administrative
$200K M&S/yr
$300K one-time charge for DAQ upgrade
There will be signifcant cost sharing with the SDSS project for the non-scientist FTEs and the M&S.