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DUSEL and its Physics Program¹

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The recent discoveries by the SNO, KamLAND, and Super-K collaborations; the precision measurements at MINOS, Borexino, and K2K; and the significant increases in dark matter sensitivities reported by CDMS and Xenon10, have highlighted the increasing world-wide interest in underground physics, astrophysics and other fields of science that require deep underground laboratory and research facilities. The National Science Foundation has embarked on the third and fourth stages of a program to establish a world-class, multi-disciplinary deep underground science and engineering laboratory - DUSEL. The first stage of this effort to assess the scientific drivers was completed with the release of Deep Science (<http://www.deepscience.org/>) and the associated Town Meetings (http://cosmology.berkeley.edu/DUSEL/Town_meeting_DC07/) in November 2007. I shall review this report's finding on the scientific motivations for DUSEL, the documented shortage of underground space to pursue the experiments, and additional facility requirements that influence DUSEL's design. The NSF's DUSEL Review Panel in July 2007 selected the former Homestake mine in South Dakota as the prime site to be developed for an international world-class research facility. I shall review the Homestake facility plans (<http://www.lbl.gov/nsd/homestake/>) including the near-term experimental program hosted by the state-sponsored Sanford Laboratory and the plans for the development of the entire site as a multidisciplinary user facility with depths extending to 8000 feet below ground. Our plans for DUSEL as an NSF Major Research Equipment and Facilities Construction proposal would provide funding for the facility as well as significant Initial Suite of Experiments (ISE). The Initial Suite of Experiments would be constructed concurrently with the facility as early as 2011 or 2012. I shall review a number of candidate experimental programs being considered for DUSEL's Initial Suite of Experiments of particular interest to the particle physics community including: a comprehensive long baseline neutrino program, nucleon decay experiments, dark matter searches, neutrinoless double beta decay experiments as well as solar and geoneutrino measurements and potential gravity wave and n-nbar oscillation experiments.

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