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DAEδALUS/IsoDAR: A Phased Neutrino Physics Program Using Cyclotron Decay-at-Rest Neutrino Sources

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DAEδALUS is a proposed phased neutrino physics program consisting of two flagship experiments: a search for CP violation in the neutrino sector and a definitive search for sterile neutrinos. Ultimately, DAEδALUS will comprise several accelerator-based modules located at three different distances from a single, large underground detector such as LENA, MEMPHYS, or Hyper-K. Each of these modules will employ new low cost, high power cyclotrons to produce pion decay-at-rest neutrino beams, which can be used to search for evidence of CP violation in the oscillation probability of muon antineutrinos to electron antineutrinos over baselines of ~20 km. However, at an early phase of the program, the high power DAEδALUS injector cyclotron can also be used to produce an intense isotope decay-at-rest neutrino beam. IsoDAR is a proposed experiment, which uses a 8Li decay-at-rest neutrino beam to preform a definitive search for sterile neutrinos by installing the DAEδALUS injector cyclotron in an underground lab close to a large liquid scintillator detector such as KamLAND. IsoDAR can rule out the parameter space allowed by global fits to the Reactor, SAGE, and GALLEX anomalies at 20σ in 5 years. These two flagship searches make a compelling case for the DAEδALUS phased neutrino physics program.

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