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Short-Baseline neutrino oscillation searches with the ICARUS detector

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The ICARUS collaboration employed the 760-ton T600 detector in a successful three-year physics run at the underground LNGS laboratories studying neutrino oscillations with the CNGS neutrino beam from CERN, and searching for atmospheric neutrino interactions. ICARUS performed a sensitive search for LSND-like anomalous ν_e appearance in the CNGS beam, which contributed to the constraints on the allowed parameters to a narrow region around 1 eV^2 , where all the experimental results can be coherently accommodated at 90% C.L. After a significant overhaul at CERN, the T600 detector has been installed at Fermilab. In 2020 cryogenic commissioning began with detector cool down, liquid Argon filling and recirculation. ICARUS has just started its first physics run, collecting neutrino events from the Booster Neutrino Beam and the NuMI off-axis. The main goal of the first year of ICARUS data taking will then be the definitive verification of the recent claim by NEUTRINO-4 short baseline reactor experiment both in the $\bar{\nu}_\mu$ channel with the BNB and in the $\bar{\nu}_e$ with NuMI. After the first year of operations, ICARUS will commence its search for evidence of a sterile neutrino jointly with the SBND near detector, within the Short Baseline Neutrino (SBN) program. The ICARUS exposure to the NuMI beam will also give the possibility for other physics studies such as light dark matter searches and neutrino-Argon cross section measurements. The proposed contribution will address ICARUS achievements, its status and plans for the new run at Fermilab and the ongoing developments of the analysis tools needed to fulfil its physics program.

Summary

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