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Status of the JSNS2 and JSNS2-II experiment

The JSNS2 (J-PARC Sterile Neutrino Search at the J-PARC Spallation Neutron Source) experiment will search for neutrino oscillations over a short 24 m baseline with Δm^2 near 1 eV^2 at the J-PARC Materials and Life Science Experimental Facility. The JSNS2 detector is filled with 17 tons of gadolinium-loaded liquid scintillator (LS) with an additional 31 tons of unloaded LS in the intermediate gamma-catcher and outer veto. A 1 MW proton beam (3 GeV) incident on a mercury target produces an intense neutrino beam from muon decay-at-rest. The experiment will search for muon antineutrino to electron antineutrino oscillations detected via the inverse beta decay reaction (electron antineutrino + proton \rightarrow positron + neutron), which is then tagged by the distinctive gammas from neutron capture on gadolinium. The JSNS2 experiment is expected to provide the ultimate test of the LSND anomaly by replicating nearly identical conditions with a much better S/N ratio. In June 2020, the JSNS2 experiment took the first 10 days of physics data after scintillator filling and extracted the scintillator for the summer maintenance of the MLF. Since January 2021 a long physics run has been started, following scintillator filling for the second time. In parallel, we are preparing the JSNS2-II experiment, the second phase of the JSNS2 experiment, with a second detector that has 35 tons of fiducial weight and a 48 m baseline. The second phase will improve the sensitivity of the search for sterile neutrino, especially in the low Δm^2 region. In this talk, we will summarize the detector operation and subsystems including the scintillator filling and extraction procedure, data acquisition system, preliminary data analysis status, and the prospect of the JSNS2-II experiment.

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