Neutrino Physics at J-PARC

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The physics motivation, status, and prospects of currently running and proposed neutrino experiments at J-PARC will be discussed. This includes the currently running T2K (Tokai-Kamioka) long-baseline neutrino oscillation experiment and a proposed Sterile Neutrino Search.

The currently running T2K experiment detects oscillated $\nu_\mu \rightarrow \nu_e$ appearance and unoscillated $\nu_\mu \rightarrow \nu_\mu$ disappearance neutrino events from an off-axis beam of primarily muon neutrinos produced at J-PARC. Propagated neutrinos are detected in a Near Detector complex, which sits 280 m from the neutrino source and is used to constrain the neutrino flux and measure neutrino cross sections, and in the Super-Kamiokande (SK) far detector, a 22.5 kT fiducial volume water Cherenkov detector with excellent performance in sub-GeV $\nu_e/\nu_\mu$ particle ID that sits 295 km from the neutrino source and is used to monitor neutrino oscillations.

T2K has recently released a series of very interesting and important results, including the world’s first definitive observation of neutrino appearance ($\nu_e$ appearance from a $\nu_\mu$ beam), an observation which was made with only 8% of the proposed total data. T2K has continued to accumulate data since releasing these results, and has many exciting prospects, including potentially having sensitivity to show a first hint of CP violation in the lepton sector. These T2K recent results and future prospects will be shown.

The prospects of a proposed future Sterile Neutrino Search, which plans to utilize the J-PARC Materials and Life Science Experimental Facility (MLF) to initially search for sterile neutrinos with a large mass splitting, will also be discussed.