Poster session 1 - Monday 4 July

P1.040 Improving T2K oscillation analyses using fiTQun: A new maximum-likelihood event reconstruction for Super-Kamiokande

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A new event reconstruction algorithm, fiTQun, has been developed for the Super-Kamiokande detector. Super-Kamiokande is a ring-imaging water Cherenkov detector with a 22.5-kton fiducial volume located 1000 m underground in the Kamioka Mine in Japan. Neutrino events in the detector's central volume produce charged particles whose Cherenkov rings are imaged by more than 11; 000 photomultiplier tubes (PMTs) that line the walls of the detector. This new reconstruction software is able to reconstruct the detailed kinematics of the neutrino interaction from the charge and timing information of each PMT. In contrast to previous reconstruction algorithms that use image processing and pattern recognition techniques, fiTQun uses a maximum-likelihood approach that takes advantage of the known Cherenkov emission profiles and the detector response to evaluate the likelihood of a given reconstruction hypothesis. This approach provides a unifying framework for all aspects of the event reconstruction, including kinematics, ring counting, and particle identification. Using fiTQun to reconstruct neutrino events for the Tokai-to-Kamioka (T2K) experiment can greatly improve the current event selection by reducing pion backgrounds, improving separation of electrons and muons, and reconstructing the neutrino energy with greater precision. These improvements should significantly increase T2K's sensitivity to the oscillation parameters.