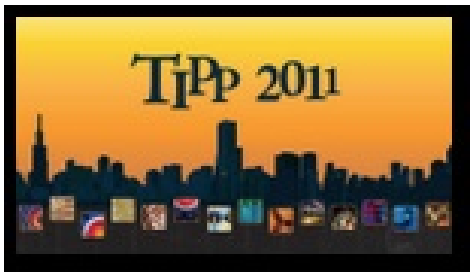

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High Precision Measurement of the Target Mass of the Daya Bay Detectors

Saturday 11 June 2011 14:40 (20 minutes)

The Daya Bay neutrino experiment utilizes the high anti-electron neutrino flux from the Guondong nuclear power complex in mainland China to perform a measurement of theta_13. The experiment uses a near-far detector technique to minimize systematic errors from reactor power fluctuations and fuel cycles. The method requires at least two "identical"near and far detectors, and for Dayabay includes a total of 8 detectors. Each detector is filled with 20 tons of gadolinium doped scintillating liquid target (GDLS), 20 tons of γ detecting plain LS and 40 tons of mineral oil buffer separated from each other by nested thin wall acrylic vessels. To keep relative systematic differences between the eight detectors below our goal of 0.4% it is important to accurately know the amount of GDLS in each detector because the number of protons in the target region scales with the mass of GDLS. This talk will describe a fluid handling system that continuously maintains the integrity of the O2 and Fe sensitive GDLS, allows the simultaneous filling of the three detector fluids while keeping tight control of liquid levels, and measures the delivered GDLS target fluid mass to a precision of 6 kg out of 20,000 Kg target mass or Δm/m = 3x10-4. The techniques we have developed may be applicable to other neutrino or dark matter experiments requiring precise mass measurements of large volumes of liquid or which handle delicate scintillating fluids.

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