APR15-2015-020099

Abstract for an Invited Paper
for the APR15 Meeting of
the American Physical Society

Solar Neutrinos and the First Real-Time Detection of pp Neutrinos from the Sun

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The Sun is fueled by a series of nuclear reactions that produce the energy that makes it shine. The primary reaction is the fusion of two protons into a deuteron, a positron and a neutrino. These neutrinos constitute the vast majority of neutrinos reaching Earth, providing us with key information about what goes on at the core of our star. Several experiments have now confirmed the observation of neutrino oscillations by detecting neutrinos from secondary nuclear processes in the Sun; this is the first direct spectral measurement of the neutrinos from the keystone proton-proton fusion. This observation is a crucial step towards the completion of the spectroscopy of pp-chain neutrinos, as well as further validation of the LMA-MSW model of neutrino oscillations.