Solar Neutrino Results from the Sudbury Neutrino Observatory and Implications for Neutrino Oscillations

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Observations of neutral current, charged current, and elastic scattering neutrino interactions in the Sudbury Neutrino Observatory have been used to determine the electron and non-electron neutrino components of the solar ^{8}B flux [1]. Assuming the standard ^{8}B shape, the electron neutrino component is $\phi_e = 1.76^{+0.05}_{-0.05}(\mathrm{stat.})^{+0.09}_{-0.09}$ (syst.) $\times 10^6$ cm^{-2}s^{-1} for a kinetic energy threshold of 5 MeV. The non-electron neutrino component is $\phi_{\mu\tau} = 3.41^{+0.45}_{-0.45}(\mathrm{stat.})^{+0.48}_{-0.45}$ (syst.) $\times 10^6$ cm^{-2}s^{-1}, 5.3σ greater than zero, providing strong evidence for solar electron neutrino flavor transformation. The total flux measured with the neutral current reaction is $\phi_{\mathrm{NC}} = 5.09^{+0.44}_{-0.43}(\mathrm{stat.})^{+0.46}_{-0.43}$ (syst.) $\times 10^6$ cm^{-2}s^{-1}, consistent with solar models. A global solar neutrino analysis (including the SNO measurement of the day and night energy spectra) in terms of matter-enhanced oscillations of two active flavors strongly favors the Large Mixing Angle (LMA) solution [2].

References

[1] SNO Collaboration. `arXiv.org:nucl-ex/0204008`.
[2] SNO Collaboration. `arXiv.org:nucl-ex/0204009`.