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Prospects for the Detection of Solar Neutrinos in DARWIN via Electron Scattering

We detail the sensitivity of the dark matter experiment DARWIN to solar neutrinos via elastic electron scattering. DARWIN will potentially measure five solar neutrino components: pp , ${}^7\text{Be}$, ${}^{13}\text{N}$, ${}^{15}\text{O}$ and pep . The precision of the ${}^{13}\text{N}$, ${}^{15}\text{O}$ and pep components are hindered by the double-beta decay of ${}^{136}\text{Xe}$ and thus would benefit from a depleted target. A high-statistics observation of pp neutrinos would allow one to infer the values of electroweak parameters at recoil energies from a few keV up to 200 keV for the first time. A combination of all flux measurements would distinguish between the high (GS98) and low metallicity (AGS09) solar models with high significance, independent of external measurements from other experiments. Finally, we demonstrate that, with a depleted target, DARWIN would be sensitive to the neutrino capture process of ${}^{131}\text{Xe}$.

Mini-abstract

DARWIN will observe solar neutrinos through elastic electron scattering.

Experiment/Collaboration

DARWIN

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