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Comprehensive measurement of pp-chain solar neutrinos with Borexino

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The sun is fueled by fusion reactions that convert hydrogen into helium. The vast majority of the resulting energy is produced through the proton-proton (*pp*) chain reaction. The byproducts of the various stages of the *pp*-chain are the so-called *pp*, *pep*, ^{7}Be, ^{8}B and *hep* solar neutrinos. They are a unique tool to gain information about the internal structure of the sun, as well as an intense natural source of neutrinos that can be used to study neutrino properties. Another known set of fusion reactions is the carbon-nitrogen-oxygen (CNO) catalytic cycle which also produces neutrinos, but has not yet been observed.

The Borexino detector is a liquid scintillator detector located in Laboratori Nazionali del Gran Sasso in the mountains of central Italy. It is particularly suitable for measuring the solar neutrinos due to its unprecedented radio-purity and resolution at low energies. A comprehensive study of the *pp*-chain was presented in a recent Nature publication by the Borexino collaboration.

The measurement reports *pp*, ^{7}Be and *pep* neutrino fluxes with the highest precision ever achieved, ^{8}B with the lowest energy threshold, the first Borexino limit on *hep* neutrinos, as well as the best limit on CNO neutrinos. These results and their physics interpretations concerning, for example, the so-called solar metallicity puzzle and the electron-neutrino survival probability, as well as other highlights of the analysis, will be summarized in this talk. The talk is presented in the name of the Borexino collaboration.

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