Final results from Borexino

Borexino is a large solar neutrino detector that has operated at the Laboratori Nazionali del Gran Sasso between May 2007 and October 2021. Neutrinos are detected via their interaction with the electrons of a 300-ton liquid scintillator target, purified to achieve unprecedented levels of radio-purity. Borexino has detected, with refined precision, most of the components of the solar neutrino spectrum, including those from the entire pp fusion chain in the Sun, using analysis tools that fully exploit our understanding of the detector. In 2020, Borexino has made the first measurement of solar CNO neutrinos, produced in a catalytic hydrogen fusion cycle enabled by the presence in the solar plasma of heavier elements, or “metals”. This observation, improved in 2022, caps three decades since the conception of Borexino and provides experimental confirmation for the pioneering solar modeling by Hans Bethe dating back to the 1930s. As the Borexino data analysis and background modeling continue to be refined, most recently, solar neutrinos were used to demonstrate that directional information can be extracted from MeV-scale electron recoils in liquid scintillator and to measure the Earth’s orbital parameters around the Sun.

This talk will review the technical and scientific legacy of Borexino, present the latest measurements, and provide an outlook on its final science.