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The potential of wavelength-shifting technology for the neutrino detection of CCSNe in IceCube-Gen2

Core-collapse supernovae (CCSNe) are known to be among the most energetic processes in our Universe and are vital for the understanding of the formation and chemical composition of the Universe. The measurement of neutrinos from CCSNe provides an important key to unravel the remaining open questions in the CCSN trigger mechanisms. Supernova sensitivity studies for the neutrino telescope IceCube show that the detection of CCSNe require both a large instrumented volume and a low noise rate. IceCube currently has sensitivity for CCSNe limited to within the Milky Way and the Large and Small Magellanic clouds, with a corresponding CCSN rate of just a few per century. The envisaged large-scale extension of the IceCube detector, IceCube-Gen2, opens the possibility for new sensor design and trigger concepts that could increase the CCSN event rate measured with IceCube. A particular focus in the development of new sensor designs has recently been on wavelength-shifting technology, as it offers the opportunity to collect more photons while not contributing to an increase of the sensor noise. Here we introduce the WOM-Trap, one of the envisaged modules for IceCube-Gen2, and its potential for the detection of CCSNe.

Author: BEISE, Jakob

Co-author: O'SULLIVAN, Erin

Presenter: BEISE, Jakob

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