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Prospects for core-collapse supernova neutrino detection in IceCube-Gen2

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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 precise measurement of the neutrino light curve from CCSNe is crucial to study the hydrodynamics and fundamental processes that drive CCSNe. The IceCube Neutrino Observatory has model-independent sensitivity within the Milky Way and some model-dependent sensitivity in the Large and Small Magellanic clouds. As IceCube detects a CCSN as a collective noise rate increase, a high signal-to-noise ratio would improve IceCube's sensitivity. 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. In this talk, we present the prospects for improved detection of MeV neutrinos in IceCube-Gen2. Segmented sensors using coincidence triggers to reduce the detector noise would enable to further expand the detection horizon to model-independently cover the Large and Small Magellanic clouds. Photon collectors using wavelength-shifting technology open the possibility to build sensors with increased photo collection area while not increasing the sensor's dark noise. This allows for fast time-varying features of the light curve of nearby supernovae to be measured with greater precision and would therefore give valuable insights into the dynamics of CCSNe.

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Yes

Primary author: BEISE, Jakob (Uppsala University)

Presenter: BEISE, Jakob (Uppsala University)

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