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Detectability of GRB blast wave neutrinos in IceCube

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Accelerated ultrahigh-energy cosmic rays (UHECRs) in long-lived gamma-ray burst (GRB) blast waves are expected to interact with X-ray to optical-infrared photons of GRB afterglow to produce PeV-EeV neutrinos. These long-lived neutrino fluxes can last for a time scale of days to years, in contrast to the prompt neutrino fluxes under the internal shocks model with a time scale of seconds to minutes and which has been constraint by recent IceCube GRB search. We calculate the expected neutrino events in IceCube in the PeV–EeV range from the blast wave of long-duration GRBs, both for individual nearby GRBs and for the diffuse flux. We show that EeV neutrinos from the blast wave of an individual GRB can be detected with long-term monitoring by a future high-energy extension of IceCube for redshift up to z ~ 0.5. We also show that with 5 years operation IceCube will be able to detect the diffuse GRB blastwave neutrino flux and distinguish it from the cosmogenic GZK neutrino flux if the UHECRs are heavy nuclei.

Collaboration

– not specified –

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132

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