

Unraveling the nature of GRBs progenitors through neutrinos

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GRBs are the most energetic electromagnetic events in the Universe. Those whose typical duration is longer than a few seconds are known as long GRBs and shorter than a few seconds are short GRBs. It is widely accepted that these events are associated with the collapse of a very massive star and the neutron star (NS) binary merger, respectively. A fast-spinning, strongly magnetized NS could be expected before a black hole (BH) in both scenarios. We allude to the thermal neutrinos' particular properties propagating inside the fireball for differentiating both scenarios in this work. We first derive the neutrino effective potential associated with each medium in a strong and weak magnetic field. We calculate the three-flavor oscillation probabilities, and finally, we get the expected neutrino rate in both scenarios. Given these observables' evolution, we can determine whether the progenitor could be associated with a strongly magnetized NS or a BH.

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