

# GRB 180720B as a binary-driven hypernova of type I

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A time-resolved analysis of GRB 180720B confirms its binary-driven hypernovae (BdHN) I nature. The accretion of supernova (SN) ejecta onto the neutron star (NS) companion leads to its gravitational collapse forming a black hole (BH). The accretion onto the newborn NS ( $\nu$ NS) spins it up to a millisecond pulsar. By interpreting the data, we identify six episodes in addition to the X-ray, GeV, and sub-TeV afterglows. The BH formation is determined by the ultra-relativistic prompt emission (UPE) phase. After reviewing the nature of six different episodes in this GRB, we confirm a self-similar hierarchical structure of the UPE characterized by a cutoff power-law plus black body (CPL+BB) spectrum on decreasing time scales. This leads to identifying the multiple expanding  $e^+ e^-$  pair electromagnetic plasma produced by the vacuum polarization quantum process in the inner engine, loaded with baryons, until the transparency point.

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