

# Numerical simulations of jet launching and breakout from collapsars

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GRBs from collapsars have been studied by imposing jets at intermediate scales beyond the iron core region while exploring a wide range of parameters, such as luminosity and central engine duration. However, these conditions should be validated by studying jets launched directly from the central engine to show a global picture of the jet propagation inside and outside of the progenitor star. In this talk, I will present GRMHD simulations of GRB jets launched from a black hole and followed through to breakout from the collapsing star. From our simulations, I will discuss the implications of the inner progenitor structure, rotation, and magnetization on the properties of the jet emission (launching, duration, structure, and the variability). In addition, I will explain how future gravitational wave detections from highly relativistic jet's material could constrain central engine properties, such as energy and lifetime.

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