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Binary neutron star merger simulations: long-lived remnants, short gamma-ray bursts, and kilonovae

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In the era of multi-messenger astrophysics, binary neutron star (BNS) mergers have proven to be one of the prime sources of gravitational waves (GWs), also able to produce short-gamma ray bursts (SGRBs) as well as radioactively powered kilonovae. General relativistic magnetohydrodynamic (GRMHD) simulations represent a fundamental tool to probe the underlying physical mechanisms involved in such merger events, including the crucial effects of magnetic fields. In this talk, I will discuss some of the key results from our recent GRMHD simulations of BNS mergers. In particular, I will focus on the importance of magnetic fields and their amplification mechanisms in merger events, the post-merger remnant structure and its rotation profile, magnetically driven mass outflows that could significantly contribute to kilonova emission, and the implications for the production of SGRB jets.

Primary authors: KALINANI, Jay Vijay (University of Padova); Dr CIOLFI, Riccardo (INAF, Astronomical Observatory of Padova, Italy); Dr KASTAUN, Wolfgang (Max Planck Institute for Gravitational Physics (AEI), Hannover, Germany); Prof. GIACOMAZZO, Bruno (University of Milano Bicocca, Italy)

Presenter: KALINANI, Jay Vijay (University of Padova)

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