

Seminarium Zakładu Fizyki Teoretycznej

Departament Badań Podstawowych
Narodowego Centrum Badań Jądrowych

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NCBJ, sala 404, Pasteura 7

Prof. Agnieszka Janiuk

Center for Theoretical Physics, Polish Academy of Sciences, Warsaw

„Modeling short gamma ray bursts from binary neutron star mergers with general relativistic magnetohydrodynamics”

ABSTRACT:

I will present the recent development of numerical tools for GR MHD modeling of the black hole accretion flows. The black hole appears as the result of a binary neutron star merger, and is surrounded by a remnant debris torus. The code named HARM_COOL is our implementation of the existing algorithm for a conservative GR MHD scheme. The newly added modules cover the neutrino cooling and the nuclear equation of state for dense matter, as relevant for the physics of accretion flows in a gamma-ray burst (GRB) central engine environment.

We also implement further post-processing with a nuclear reaction network, and reproduce the nucleosynthesis of heavy, neutron-rich isotopes. These elements are synthesized within the magnetically driven outflow from the remnant torus. These fast wind outflows ($v/c \sim 0.11-0.23$) appear with a broad range of electron fraction $Y_e \sim 0.1-0.4$. The total mass loss from the post-merger disk via unbound outflows is between 2% and 17% of the initial disk mass. The results are in agreement with the scenarios that explain blue and red kilonova components, detected in optical lightcurves after the gravitational wave event GW 170817.

Serdecznie zapraszamy,

M. Kowal, W. Piechocki, J. Skalski, L. Szymanowski