

Explosion of fast spinning sub-Chandrasekhar mass white dwarfs

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We study the explosion of rotating sub-Chandrasekhar mass white dwarfs using three-dimensional hydrodynamic simulations. High rotational speeds are assumed in order to significantly distort the initial spherical geometry of the white dwarf. Unlike spherically symmetric models, when He-ignition is located far from the spinning axis the detonation wave trains arrive asynchronously to the antipodes.

Models considering different masses of the He-shell, He-ignition locations and rotational velocities, assuming rigid rotation in all cases, are analyzed. We study independently both, the detonation of the He-shell, artificially avoiding carbon-ignition, and the complete detonation of the white dwarf.

The spontaneous detonation of the carbon-oxygen core is obtained in all calculated models. The explosion energies and nucleosynthesis match the basic observational constraints of Type Ia Supernovae, confirming the viability of the Double Detonation mechanism when the white dwarf is spinning fast.