

Gravitational waves from core-collapse supernovae

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A mechanism of formation of gravitational waves in the universe is considered for the nonspherical collapse of matter. Nonspherical collapse results are presented for a uniform spheroid of dust, and a finite entropy spheroid. Numerical simulation results on core-collapse supernova explosion are presented for the neutrino and magneto-rotational models. These results are used to estimate the nondimensional amplitude of the gravitational wave of a frequency about 1000 Hz, radiated during the collapse (calculated by the authors in 2D) of the rotating nucleus of a pre-supernova. This estimate agrees well with many other calculations, which have been done in 2D and 3D settings and which rely on more exact and sophisticated calculations of the gravitational wave amplitude.

It is noted that the gravitational wave radiated during a core-collapse supernova flash in our Galaxy is of sufficient amplitude to be detected by existing gravitational wave telescopes.

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