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GRAVITATIONAL WAVES AND CORE-COLLAPSED SUPERNOVAE

Abstract

We consider formation of gravitational waves in the universe during nonspherical collapse of the matter. Results are presented for collapse of a uniform dust spheroid, and spheroid with a finite entropy. Results of numerical calculations of supernovae explosions due to collapse of rotating stellar core are considered in the neutrino and magnetorotational models. These results are used for estimation of the gravitational wave signal from the non-spherical collapse. The results of analytical estimations are in good correspondence with numerical calculations in 2 and 3 dimensional models, by detailed consideration of time derivatives of quadrupole momentum of collapsing models. Amplitude of very long gravitational waves is estimated, which is radiated during nonspherical collapse of dark matter. Such collapse happens during formation of a large scale structure of the universe in the Zeldovich pancake model. The gravitational waves radiated during a core-collapse supernova explosion in our Galaxy is of sufficient amplitude to be detected by some existing gravitational wave telescopes.