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Influence of a magnetic field on beta-processes in supernova matter

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An influence of a magnetic field on beta-processes is investigated under conditions of a core-collapse supernova. For realistic magnetic fields reachable in astrophysical objects we obtain simple analytical expressions for reaction rates of beta-processes as well as the energy and momentum transferred from neutrinos and antineutrinos to the matter. Based on the results of one-dimensional simulations of a supernova explosion, we found that, in the magnetic field with the strength $B \sim 10^{15}$ G, the quantities considered are modified by a few percents only and, as a consequence, the magnetic-field effects can be safely neglected, considering neutrino interaction and propagation in a supernova matter. The analytical results can be also applied for accretion discs formed at a merger of compact objects in close binary systems. The work is supported by the Russian Science Foundation (Grant No. 18-72-10070).

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