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Nucleon mean free path in nuclear matter based on nuclear Schwinger-Dyson formalism

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abstract A mean free path of nucleon moving through nuclear matter with kinetic energy of more than 100MeV is formulated based on the bare vertex nuclear Schwinger-Dyson (BNSD) method in the Walecka model. The self-energy which is derived from the higher order diagrams more than the forth order includes the Feynman part of propagator of energetic nucleon and grows up rapidly as an increase of kinetic energy. To avoid too large growth of these diagrams, meson propagators are modified by introducing some form factors to take account of a internal structure of hadron. It is confirmed that the mean free path calculated by the BNSD method agrees good with experimental data if a reasonable form factor is chosen, i.e., a dipole (quadrupole) type of form factor with a cut-off parameter about 750 MeV $\sim$ 1000 MeV (1200 MeV $\sim$ 1500 MeV).