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New solutions of the Boltzmann equation for massless scalar particles in an expanding universe NICKI MULLINS, Illinois Center for Advanced Studies of the Universe, Department of Physics, University of Illinois at Urbana-Champaign, GABRIEL DENICOL, Instituto de Fsica, Universidade Federal Fluminense, JORGE NORONHA, Illinois Center for Advanced Studies of the Universe, Department of Physics, University of Illinois at Urbana-Champaign — The dynamics of massless particles with quartic interactions in Friedman-Lemaitre-Robertson-Walker spacetime are studied through solutions to the nonlinear relativistic Boltzmann equation. Using a new generation function method, the Boltzmann equation is expressed as an infinite set of coupled ordinary differential equations for suitably defined moments of the distribution function. Our new formulation allows for numerical solution of the evolution of the moments, which in turn can be used to recover the full distribution function. Furthermore, the linearized Boltzmann operator for this system is diagonalized, and the corresponding eigenfunctions and eigenvalues are given in explicit form. Finally, a comparison between our results and previous calculations for the dynamics of particles with constant cross section interactions is made.

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