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Nonstationary Stochastic Process of Dust Particle Charging in Plasmas BABAK SHOTORBAN, The University of Alabama in Huntsville — The one-step process master equation of dust particle charging [T. Matsoukas and M. Russell, J. Appl. Phys. 77, 4285 (1995)] was expanded through the system size expansion method of Van Kampen and then having made the linear noise approximation, a linear Fokker-Planck equation with a Gaussian solution was derived. The mean and variance of the Gaussian solution are governed by two time-dependent ODEs that can describe nonstationary stochastic charge of the dust particle. A test problem in which the electron and ion currents were calculated through the orbital motion limited theory was solved using these equations. The results were in very good agreement with the results obtained through directly solving the master equation.

Babak Shotorban
The University of Alabama in Huntsville

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