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In Eqs. (12-17) of [1], a next higher-order correction in powers of $\Delta t^{1/2}$ to the Langevin equations for Coulomb collisions was derived. In Eq. (16) of [1] the one-dimensional drag-diffusion equation is given as

$$y_{n+1} = y_n + a(y_n)\Delta t + b(y_n)\Delta W + \frac{1}{2} b \frac{db}{dy} \left( \Delta W^2 - \Delta t \right)$$

where $a$ is the drag coefficient, $b$ is the diffusion coefficient, $y_n$ represents a velocity variable at time step with index $n$, and $\Delta W$ is a Gaussian random variable with zero mean and variance $\Delta t$. The last term in Eq. (1) is the so-called Milstein correction [2]. The $\Delta W^2$ in the Milstein term is the square of the $\Delta W$ in the diffusion term.

In Eq. (17) an error was made by us in the Milstein term: namely, the same random number $N_i^2$ should have been used rather than a new random number $N_i^2$ in keeping with Eq. (1) given here. The corrected version of Eq. (17) in [1] is thus

$$v_{z,t}^{+1} = v_{z,t} + F_d \Delta t + g \Delta t^{1/2} N_i + \frac{1}{2} g \frac{dg}{dv} \Delta t (N_i^2 - 1)$$

$$v_{\perp i,t}^{\perp 1} = \Delta v_{\perp i,t}$$

Furthermore, $N_i^2$ should be replaced in the text of [1] with $N_i^2$ wherever $N_i^2$ appears after Eq. (17). The error in Eq. (17) of [1] propagated into the simulations whose results are reported in Fig. 7 of [1]. We have corrected the simulation algorithm and repeated the simulations shown in Fig. 7 of [1]. The new numerical results differ very little from the previous results (<1% difference) and are not detectable to the eye in the revised Fig. 7 of [1]. This is a consequence of the fact that the Milstein correction has little effect on moments of the velocity distribution owing to $<N_i^2-1>=0$ and the smallness of the coefficient $dg/dv$ in the Milstein term in Eq. (2) over most of the velocity distribution as discussed in Sec. III of [1].

REFERENCES


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