

Potential distributions around test charge particles in a dusty plasma

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A three-component complex (dusty) plasma, which is composed of electrons, singly ionized positive ions, and highly charged dust particulates, is considered. For the purpose to compute the electrostatic potential distribution around a test charge, the Vlasov-Poisson set of equations is solved to obtain a generalized plasma response function. Several possibilities for dressed charge potential are considered by imposing different conditions on the test charge velocity in comparison with thermal speeds of plasma species. A Debye potential is shown for a static or slowly moving test charge and the resonant interaction of test charge with dust acoustic wave gives rise to the formation of wakefield. The work is further extended to examine the correlation and dust-charge fluctuation effects on the electrostatic potential due to multiple test charge projectiles moving with a constant velocity along the z-axis. The present results are important for the low-temperature laboratory and astrophysical plasmas.