Manuel I Marqués, J Laser Opt Photonics 2018, Volume 5
DOI: 10.4172/2469-410X-C1-023

Electromagnetic drag and diffusion control

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Fluctuating isotropic electromagnetic fields are obtained by considering a group of plane waves with wave vectors, polarizations and phases randomly distributed and fluctuating on time. Due to the isotropic character of this electromagnetic field, the optical force induced on a nanoparticle is, in average, equal to zero. However, the dynamics of electric dipoles on these kind of systems are far from being trivial. Due to the nonzero value of the optical force fluctuations, super diffusive, diffusive and accelerated regimens are induced on a single dipole. In this work, the expressions for the random force fluctuations, the optical drag force, the equilibrium kinetic energy and mean square displacement are derived. The conditions to be fulfilled by the polarizability of the dipole in order to obtain a positive, a null, and a negative drag coefficient are analytically determined and checked against numerical simulations for the dynamics of a silver nanoparticle.

Biography

Manuel I Marqués obtained his BA in Physics at Universidad Complutense de Madrid in 1995 and was awarded with an extraordinary PhD prize in Physics at Universidad Autónoma de Madrid in 2000 under the supervision of Prof. Julio Gonzalo. He is a Fulbright fellow at Boston University from 2001 to 2003 where he performed a Postdoctoral research in the group of Prof. Gene Stanley. In 2003 he was awarded with a Ramón y Cajal appointment at the Universidad Autónoma de Madrid. He is now an Associate Professor in the Material Physics Department and Member of the Institute of Condensed Matter Physics (IFIMAC). His research interests are mainly focused on phase transitions and light matter interactions. He has coauthored more than 80 scientific articles with more than 1100 citations

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