Title:	Unified treatment of nonlinear optical force in laser trapping of dielectric particles of varying sizes
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Abstract:	Optical trapping using laser tweezer has revolutionized the field of force spectroscopy having enormous applications in biological manipulation. While a number of theories were developed for particles of different sizes to estimate trapping force under continuous-wave excitation, they were not under short pulsed excitation which leads to nonlinear optical force. Here, we present a comparative study of various theories and provide a unified description for laser trapping under femtosecond pulsed excitation. Numerical results show that exact Mie theory (EMT) can provide a precise qualitative and quantitative prediction of trapping force when optical Kerr effect is included. Moreover, we also show how Mie interference phenomena, leading to observation of Fano resonance, are naturally captured within EMT. Thus, our findings pave the way for potential far-reaching applications in the accurate numerical estimation of nonlinear optical force on arbitrary-sized spherical dielectric particles.
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