Abstract Submitted
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Long-range plasmon-assisted energy transfer over doped graphene[1] KIRILL VELIZHANIN, Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM 87545, USA, TIGRAN SHAHBAZYAN, Department of Physics, Jackson State University, Jackson, MS 39217, USA — Förster resonance energy transfer (FRET) between spatially separated donor and acceptor fluorophores, such as dye molecules or semiconductors quantum dots, underpins diverse phenomena in physics, chemistry and biology. However, the range of present and potential applications of FRET is limited by its intrinsically short-range nature ($\sim 1/R^6$). We demonstrate that longitudinal plasmons in doped monolayer graphene can mediate highly efficient long-range ($\sim 1/R$) energy transfer between nearby fluorophores, e.g., semiconductor quantum dots. We derive a simple analytical expression for the energy transfer efficiency that incorporates all the essential processes involved. We perform numerical calculations of the transfer efficiency for a pair of PbSe quantum dots near graphene for inter-fluorophore distances of up to 1 μm and find that the plasmon-assisted long-range energy transfer can be enhanced by up to a factor of $\sim 10^4$ relative to FRET in vacuum.

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