

Erratum: Landé g Factors and Orbital Momentum Quenching in Semiconductor Quantum Dots [Phys. Rev. Lett. 96, 026804 (2006)]

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Our Letter concerning g factors in quantum dots contained a sign error in the reported g factors for \vec{B} oriented along the [001] direction. The main result of the Letter, that angular momentum quenching drives g towards the free electron value of 2, is unchanged. The g factors shown in Fig. 2 of the Letter should have the opposite signs, as in the corrected graphs shown below (Fig. 1). For both electrons and holes, $g = \text{sgn}(q)(E_{\uparrow} - E_{\downarrow})/\mu_B B$, where E_{\uparrow} (E_{\downarrow}) is the energy of the state with spin parallel (antiparallel) to the magnetic field B , μ_B is the Bohr magneton, and q is the charge of the electron or hole.

The last sentence of the last paragraph beginning on page 3 should instead read: “We identify the sign to be negative based on our calculations.” Also, the last sentence of the first paragraph beginning on page 4 should read: “Due to orbital angular-momentum quenching, the actual electron g factors shown in Fig. 2 are positive for small dots.”

The InAs in InAs/GaAs dots formed by self-assembly in MBE is highly strained in order to accommodate the differing lattice constants of InAs and the GaAs substrate. The electron g factor predicted from Eq. (1) for InAs strained in this way is negative, as is the known g factor for unstrained GaAs. Yet the electron g factors are positive for small dots (Fig. 2). Thus the bulklike approach to g factors in these quantum dots, averaging the g factors over the dot and barrier material [14, 15], also fails. Our results agree with recent experiments on electron g factors [5]. We predict that hole g factors have large negative values for magnetic fields in the growth direction and small negative values in the in-plane directions (Figs. 2–3) and are sensitive to the dot shape. The calculations presented here are for unstrained InAs spherical nanocrystals and strained InAs/GaAs MBE-grown quantum dots, but our qualitative conclusion—that the “artificial atom” viewpoint is vitally important to understanding g factors—applies to all small quantum dots.

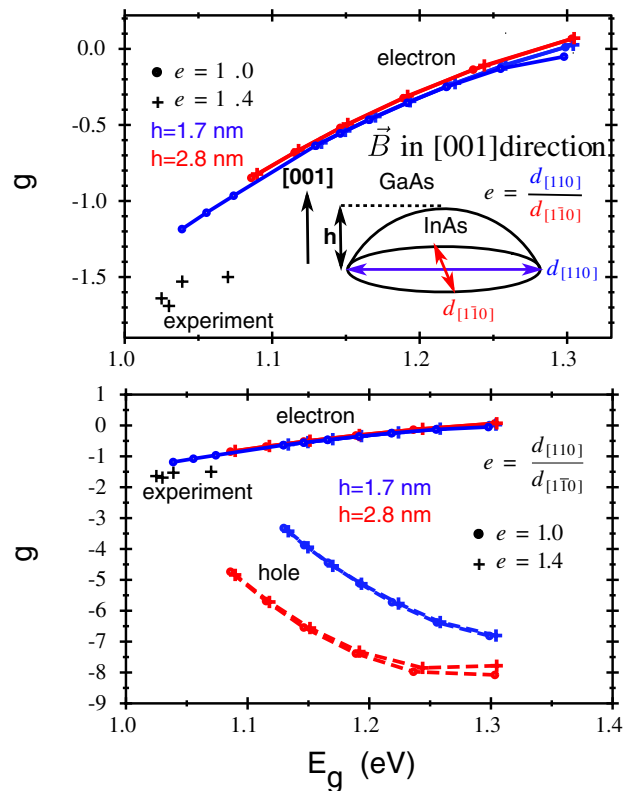


FIG. 1 (color online). InAs/GaAs quantum dot g factors for \vec{B} in the [001] direction as a function of the dot size (parametrized by E_g), for various dot shapes. Solid lines are for the lowest energy electron; dashed lines are for the lowest energy hole. Experimental values are from Ref. [5]. For both electrons and holes, $g = \text{sgn}(q)(E_{\uparrow} - E_{\downarrow})/\mu_B B$, where E_{\uparrow} (E_{\downarrow}) is the energy of the state with spin parallel (antiparallel) to the magnetic field B , μ_B is the Bohr magneton, and q is the charge of the electron or hole.