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Giant Orbitals Currents in Nanostructures[1] RALPH SKOMSKI, D.J. SELLMYER, Department of Physics and Astronomy & NCMN, University of Nebraska, Lincoln, NE 68588 — The possibility and origin of giant orbital currents [1] in nanostructures is investigated by model calculations. We compare two models: (i) a model where electrons are confined to a "racetrack" around the dot and (ii) a tight-binding model where atomic spin-orbit coupling creates macroscopic currents at the periphery of the dots. The first model yields expressions very similar to Ref. 1, but the corresponding spin-orbit coupling [2] is negligibly small, because it strongly decreases with increasing orbital radius. Furthermore, the orbital moment rapidly collapses due to a redistribution of electron with wave vectors of opposite sense of rotation. In the second model, the relatively strong intra-atomic spin-orbit interaction yields orbital currents that add [3] between neighboring atoms and create a macroscopic current at the periphery of the dot. This current corresponds to a magnetic Berry phase and cannot dissipate, because the underlying atomic orbital moments are quantized. References: [1] A. Hernando, P. Crespo, and M. A. García, Phys. Rev. Lett. **96**, 057206 (2006). [2] R. Skomski, IEEE Trans. Magn. **32**, 4794 (1996). [3] J. Zhang, R. Skomski, Y. F. Lu, and D. J. Sellmyer, Phys. Rev. B **75**, 214417 (2007).

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