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Topological Hunds rules and the electronic properties of a triple lateral quantum dot molecule P. HAWRYLAK, M. KORKUSINSKI, F. DELGADO, L. GAUDREAU, S. STUDENIKIN, A. KAM, A. SACHRAJDA, Institute for Microstructural Sciences, National Research Council of Canada — We analyze theoretically and experimentally the electronic structure and charging diagram of three coupled lateral quantum dots in a magnetic field filled with electrons. Using the Hubbard model and real-space exact diagonalization techniques we show that the electronic properties of this artificial molecule can be understood using a set of topological Hunds rules[1]. These rules relate the multi-electron energy levels to spin and the inter-dot tunneling t, and control charging energies. We map out the charging diagram for up to N=6 electrons and predict a spin singlet for two electrons, spin-polarized phase for two holes, and a magnetically frustrated ground state for three electrons. We show that spin polarization can be tuned by magnetic field perpendicular to the triple dot device. The theoretical charging diagram is compared with the measured charging diagram of the gated triple-dot device[1]. [1] P. Hawrylak and M. Korkusinski, Solid State Commun. 136, 508 (2005). [2] L. Gaudreau, S. A. Studenikin, A. S. Sachrajda, P. Zawadzki, A. Kam, J. Lapointe, M. Korkusinski, and P. Hawrylak, Phys. Rev. Lett. 97, 036807 (2006).

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