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Scanning Probe Microscopy of Quantum Chains ISRAEL MANDEL, GABRIEL CWILICH, FREDY ZYPMAN, Department of Physics - Yeshiva University — Quantum strongly correlated spin systems exhibit energy spectra related to their underlying classical dynamics. For integrable systems, the level-spacing is Poissonian, while for chaotic dynamics, it follows a Wigner-Dyson distribution, corresponding to localized and metallic phases [1,2] Linear spin chains and braids have been considered recently [3] showing that a certain degree of disorder or the presence of impurities along the chain induces a transition from one statistic to the other. We consider a quantum Heisenberg system of two perpendicular linear chains (T-shaped) interacting through the points of closest approach between them. The motivation is to model the tip of a Magnetic Force Microscope, the separation between tip and sample playing the role of an impurity (a different hopping parameter). We study the level-spacing statistics of the whole system as a function of tip-sample separation, observing a transition in level statistics, inducing a change in the total energy, detectable by monitoring the force between tip and sample. We propose a tool to search for signatures of an integrable-to-chaotic transition by looking at the force-separation curves in Scanning Probe Microscopy. [1] Shklovskii B I, Shapiro B, Sears B R, Lambrianides P and Shore H B 1993 *Phys. Rev.* B **47** 11487 [2] Braun D, Montambaux G and Pascaud M 1998 *Phys. Rev. Lett.* **81** 1062 [3] Lea F. Santos, Phys Rev E78, 031125 (2008)

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