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Hubbard to Heisenberg crossover behavior in the magnetic excitation spectrum of strongly correlated quasi-one dimensional systems ALBERTO NOCERA, Oak Ridge National Laboratory, NIRAVKUMAR D. PATEL, JAIME FERNANDEZ-BACA, ELBIO DAGOTTO, University of Tennessee, Knoxville and Oak Ridge National Laboratory, GONZALO ALVAREZ, Oak Ridge National Laboratory — Magnetic excitations of quasi-one dimensional strongly correlated materials are often described in terms of model Hamiltonians where only spin degrees of freedom are taken into account –typically the Heisenberg Hamiltonian, which represents the main paradigm for quantum magnetism. This is due to the presence of strong electronic correlations, which energetically suppress the possibility of double occupation of the outer shell orbitals and the electronic mobility. In this talk, using the density matrix renormalization group method, we calculate the dynamical spin structure factor of the Hubbard model at half electronic filling on a chain and on a ladder geometry, and compare the results with those obtained using the Heisenberg model. We show the surprising result that even at intermediate values of the Hubbard repulsion U, the spectra qualitatively closely resemble the Heisenberg result. However, even in these cases electronic itinerancy effects cannot be neglected to understand quantitatively the magnetic excitation spectra. We discuss the implications of the results for neutron scattering experiments and we propose criteria to deduce the actual value of U from experimental information, even when Heisenberg models appear to describe the data accurately

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