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Long distance entanglement mediated by gapped spin chains AIRES FERREIRA, JOAO LOPES DOS SANTOS, CFP and Dept Fisica, Faculdade de Ciencias da Universidade do Porto — This talk will describe an analytical approach for the computation of Long Distance Entanglement (LDE) mediated through one-dimensional quantum spin chains recently found in numerical studies [1]. I review the formalism [2] that allows the computation of LDE for weakly interacting probes with gapped many-body systems and show that, at zero temperature, a DC response function determines the ability of the physical system to develop genuine quantum correlations between the probes. In the second part of the talk, I show that the biquadratic Heisenberg spin-1 chain is able to produce LDE in the thermodynamical limit and that the finite antiferromagnetic Heisenberg chain maximally entangles two spin-1/2 probes very far apart. This is of crucial importance since feasible mechanisms of entanglement extraction from real solid state systems and their ability to transfer entanglement between distant parties are essential ingredients for the implementation of Quantum Information protocols, such as teleportation or superdense coding.

[1]L. Campos Venuti, C. Degli Esposti Boschi and M. Roncaglia, Phys. Rev. Lett. **96** 247206 (2006).
[2]A. Ferreira and J. M. B. Lopes dos Santos, *submitted for publication in APS* preprint: arXiv:0708.0320 (2007).

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