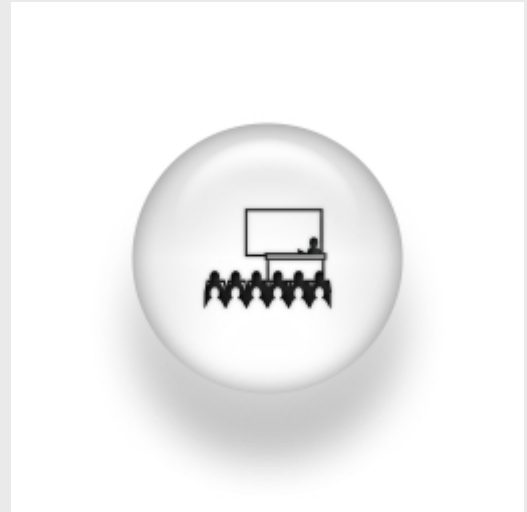


Entanglement and Quantum Criticality

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Prof. Miguel Ibañez

Instituto Fisica Teorica UAM/CSIC

ABSTRACT:

After a brief introduction to the concept of quantum entanglement we will immediately focus on some aspects of the role played by quantum information in the physics of many-body systems. We will expose the so called “area law”, which establishes an upper bound for the amount of entanglement in ground states of gapped Hamiltonians. Together with a 7-minute introduction to Conformal Field Theory we will then discuss the violation of the area law in one spatial dimension at criticality and the universal features exhibited by the ground state entanglement in this case [1]. Finally, a novel generalization of these results will be mentioned: the entanglement of critical excitations [2], a work which uncovers a further link between quantum information measures in 1d systems and the Conformal Field Theories describing their continuum limit.

[1] C. Holzhey, F. Larsen, L. Wilczek, Nucl. Phys. B 424, 443 (1994);

P. Calabrese, J. Cardy, J. Stat. Phys., 06 P06002 (2004).

[2] F. Alcaraz, M. Ibanez, G. Sierra, Phys. Rev. Lett., in press (2011).