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Universal entanglement singularities in quantum critical spin chains TZU-CHIEH WEI, DYUTIMAN DAS, SWAGATAM MUKHOPADYAY, SMITHA VISHVESHWARA, PAUL M. GOLDBART, University of Illinois at Urbana-Champaign — The entanglement of the quantum XY spin chain in a transverse field is investigated via a recently-developed global measure, applicable to generic quantum many-body systems [1]. This entanglement is determined throughout the phase diagram, and is found to exhibit rich structure [2]. Near the critical line, the entanglement is peaked (albeit analytically), consistent with the notion that entanglement – the non-factorization of wave functions – reflects quantum correlations. Singularity does, however, accompany the critical line, as revealed by the divergence of the field-derivative of the entanglement. The form of this singularity appears to be dictated by the universality class controlling the quantum phase transition.

[1] T.-C. Wei and P. M. Goldbart, Phys. Rev. A 68, 042307 (2003).
[2] T.-C. Wei et al., quant-ph/0405162.

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