

Abstract Submitted  
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**Majorana dimerised order in magnetic systems** EDMUND BENNETT, University of St Andrews — We consider the analysis of quantum critical points (QCPs) using a Majorana fermion<sup>1</sup> representation of spin. Majorana fermions are a useful spin representation as they obey Wick’s theorem and automatically provide the correct  $S_{\text{tot.}}^2 = 3/4$  for stationary spin-1/2 lattice spins. We consider an Ising model in various dimensions in an applied transverse field, a model which exhibits a QCP and has an exact solution in 1D. In the Majorana fermion representation, the interaction vertex may be decoupled into either a “Majorana dimerisation (MD)” decoupling or an Ising magnetic decoupling. A mean-field analysis of the MD decoupling (which involves two Majorana fermions of the same flavour on adjacent lattice sites) suggests an ordered phase in the region above the QCP extant in the model, which extends through to high magnetic fields. Full RPA corrections to this mean-field theory are also presented, which give insight into the stability of this ordered phase to quantum perturbations.

<sup>1</sup>W. Mao, P. Coleman, C. Hooley & D. Langreth; PRL, 91, 20, p. 2072031-2072034; 2003

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