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Universal properties of the Higgs mode near quantum critical points SNIR GAZIT, DANIEL PODOLSKY, ASSA AUERBACH, Physics Department, Technion, IL-32000 Haifa, Israel — Spontaneous symmetry breaking of relativistic models with $O(N)$ symmetry results in the emergence of two elementary excitations: the Goldstone modes and the Higgs mode. The massive Higss mode can decay into pairs of Goldstone modes, broadening the spectral line and hence questioning its visibility. Recently a set of *scalar* response functions was introduced, in which the Higgs mode appears as a well defined peak [1]. We investigate the universal properties of the scalar susceptibility near the quantum critical point in 2+1 dimensions for $N = 2$ and $N = 3$ using Monte Carlo simulation. We demonstrate that the scalar spectral function contains a peak associated with the Higgs mode, which remains well-defined even upon approach to the critical point. We extract properties that characterize the Higgs peak, including the fidelity of the peak and the ratio ω_H/Δ between the Higgs energy on the ordered side and the single particle gap on the disordered side. The universal nature of these results make them relevant to a broad range of experiments in condensed matter and atomic systems.

[1] D. Podolsky, A. Auerbach, and D. P. Arovas, Phys. Rev. B 84, 174522 (2011)

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