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Violation of hyperscaling at the Ising-nematic quantum critical point in a two-dimensional metal ANDREAS EBERLEIN, Harvard University, IPSITA MANDAL, Perimeter Institute for Theoretical Physics, SUBIR SACHDEV, Harvard University and Perimeter Institute for Theoretical Physics — Spatially isotropic critical quantum states in d spatial dimensions which have the hyperscaling property have an optical conductivity that scales as $\omega^{(d-2)/z}$ for high frequencies $\omega >> T$, where T is the temperature and z the dynamic critical exponent. We examine the Ising-nematic quantum critical point in $d = 2$ using the fixed point theory by Dalidovich and Lee (Phys. Rev. B 88, 245106 (2013)) and compute the optical conductivity in an expansion in $\epsilon = 5/2 - d$. We show that hyperscaling is violated at this quantum critical point and discuss the scaling behaviour of the optical conductivity at $T = 0$.

Andreas Eberlein
Harvard University

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