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From a complex scalar field to the two-fluid picture of superfluidity S. KUMAR MALLAVARAPU, MARK ALFORD, Washington University in St Louis, ANDREAS SCHMITT, STEPHAN STETINA, Vienna University of Technology — In the field theoretic formulation of a zero-temperature superfluid one connects the superfluid four-velocity which is a macroscopic observable with a microscopic field variable namely the gradient of the phase of a Bose-Condensed scalar field. On the other hand, a superfluid at nonzero temperatures is usually described in terms of a two-fluid model: the superfluid and the normal fluid. In this talk we offer a deeper understanding of the two-fluid model by deriving it from an underlying microscopic field theory. In particular, we shall obtain the macroscopic properties of a uniform, dissipationless superfluid at low temperatures and weak coupling within the framework of a φ^4 model. Though our study is very general, it may also be viewed as a step towards understanding the superfluid properties of various phases of dense nuclear and quark matter in the interior of compact stars

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