IKT for quantum hydrodynamic equations

MASSIMO TESSAROTTO, Trieste University, Department of Mathematics and Informatics, MARCO ELLERO, TUM (Technical University of Munich), Germany, PIERO NICOLINI, Trieste University, Department of Mathematics and Informatics — A striking feature of standard quantum mechanics (SQM) is its analogy with classical fluid dynamics. In fact, it is well-known that the Schrödinger equation is equivalent to a closed set of partial differential equations for suitable real-valued functions of position and time (denoted as quantum fluid fields) [Madelung, 1928]. In particular, the corresponding quantum hydrodynamic equations (QHE) can be viewed as the equations of a classical compressible and non-viscous fluid, endowed with potential velocity and quantized velocity circulation. In this reference, an interesting theoretical problem, in its own right, is the construction of an inverse kinetic theory (IKT) for such a type of fluids. In this note we intend to investigate consequences of the IKT recently formulated for QHE [M.Tessarotto et al., Phys. Rev. A 75, 012105 (2007)]. In particular a basic issue is related to the definition of the quantum fluid fields.