IKT for quantum hydrodynamic equations MASSIMO TES-
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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 theoret-
ical 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.

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