Superfluidity and Chaos GEVA ARWAS, AMICHAY VARDI, DORON
COHEN, Ben-Gurion University — The hallmark of superfluidity is the appear-
ance of a quantized metastable circulating current. The Landau criterion links the
metastability of a vortex state to its spectral stability, i.e. to the inaccessibility
of elementary excitations connecting it to other states with the same energy. In
low dimensional systems, superfluid vortex states can exist due to their dynamical
stability even if they are spectrally unstable. This traditional paradigm associate
superfluid vortex states with stationary stable fixed points in phase space. Hence,
Bogoliubov de Gennes (BdG) stability analysis is normally used to determine the
feasibility of such states. In this work we challenge this traditional criterion and
highlight the role of chaos in the analysis, thus explaining the existence of current
carrying eigenstates which are neither spectrally-stable nor dynamically- stable.

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