



Contribution ID: 44

Type: **not specified**

## Hydrodynamics of the Gross-Pitaevskii equation in general Riemannian metric

*Tuesday, 7 September 2021 12:00 (15 minutes)*

Here we show that the standard 3D Gross-Pitaevskii equation (GPE) [1,2] for Bose-Einstein condensates (BECs) admits hydrodynamic interpretation in a general Riemannian metric. This is done by deriving the corresponding Euler and Navier-Stokes forms in full generality. We also show [3] that in this metric the momentum equation has a new term that is associated with local curvature and density distribution profile. This work may find applications in analogue gravity models in cosmology.

This is joint work with Alice Roitberg (UniMiB).

[1] Gross E.P. 1961 Structure of a quantized vortex in boson systems. *Il Nuovo Cimento* **20**, 454-477.

[2] Pitaevskii L.P. 1961 Vortex lines in an imperfect Bose gas. *Sov. Phys. JETP* **13**, 451-454.

[3] Roitberg A. & Ricca R.L. 2021 Hydrodynamic derivation of the Gross-Pitaevskii equation in general Riemannian metric. *J. Phys. A: Math. Theor.* **54**, 315201.

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**Session Classification:** Gravity Theory

**Track Classification:** Gravity theory