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Trans-Planckian issues and Emergent Gravity: from BEC to analogue Black Holes[1] SUPRATIK SARKAR[2], A. BHATTACHARYAY[3], Indian Institute of Science Education and Research (IISER) - Pune, India — To account for the non-local interactions in a Bose-Einstein Condensate (BEC), an addition of a minimal correction term to the standard Gross-Pitaevskii model effectively can make the healing length ξ decrease more rapidly with the increase of s-wave scattering length (a). From analogue gravity perspectives, this shrinking of ξ via tuning a through Feshbach resonance, in principle, does make the short-wavelength (i.e. high energy) regime more accessible experimentally by pushing the Lorentz-breaking dispersion even more towards the UV side. The effects of the Lorentz-breaking quantum potential term in the BEC-dynamics on independent multiple scales can be captured through a UV-IR coupling of the phonon-excitation-modes of a massive minimally coupled Klein-Gordon field. The analysis was argued on a (3+1)D flat spacetime. The analysis is extended for a canonical acoustic black hole in a (3+1)D curved spacetime through presenting an analogue gravity model upto $\mathcal{O}(\xi^{\in})$ accuracy. In our formalism, the growth rate of the large-wavelength 'secondary' ω modes is found to hold the clue to extract the lost information regarding the short-wavelength 'primary' ω_1 modes. This can reveal the relative abundance of the originally Hawking radiated quanta.

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