

From Bose condensates to black holes: Tribute to Bogoliubov

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The interface between statistical and optical physics is rich and full of surprises. The present perspective is based on the analogy between lasers and second order phase transitions [1,2], on the one hand, and radiation emitted by accelerating atoms in the vicinity of a black hole, on the other.

The formalism developed by Bogoliubov in the context of superfluid behavior is a powerful tool in these studies. The dynamics of interacting superfluid Bose condensates [3] is naturally developed in the Bogoliubov formalism in which atom pairs, k and $-k$, are studied. New insights into the Unruh – Hawking radiation problem come from similar pairing correlations within the Bogoliubov analysis.

This approach to the problem of Unruh – Hawking radiation gives us new insight into Einstein's equivalence principle and into rather subtle aspects of causality associated with acceleration radiation [4].

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- [4] M. Scully, S. Fulling, D. Lee, D. Page, W. Schleich, and A. Svidzinsky, "Quantum optics approach to radiation from atoms falling into a black hole," PNAS (2018).