Differential geometric aspects of quantum vortex theory

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Abstract

In this survey talk we review the symplectic geometric interpretation of the Rasetti-Regge theory of quantum vortices in 3-space, together with the algebro-geometric approach to vortex theory on Riemann surfaces and some topological aspects of anyon theory, mostly in the framework of Kirillov-Kostant-Souriau geometric quantization, stressing in particular the significance of the Feynman-Onsager quantization condition and the strong connections with knot and braid theory. We also discuss related approaches (Goldin-Menikoff-Sharp, Morrison-Speliotopoulos, Wu, Black etc.), pointing out possible directions for future developments. This research has been carried out at various stages with V. Penna, M. Rasetti and A. Besana.