

## SEMINAR

# Structural crossovers in trapped ions dispersively coupled to optical cavities

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*Venue:* Physics Seminar Room, Stellenbosch University, and online

**ABSTRACT**

We consider an optomechanical system composed of a trapped ion dispersively coupled to a single mode of a pumped optical cavity. We focus on a parameter range that exhibits bistability of different configurations in the semiclassical description. This semiclassical description, however, is not valid in close proximity to the system transitions or when the mean photon number is low. Here, we provide a numerical analysis of the fully quantum state in the few-photon regime, exploring the features of the asymptotic state across the transition and analyzing possible markers of semiclassical bistability. For larger mean photon numbers, we resort to an approach based on a truncated evolution in phase space. We compare the results of our techniques with the ones from numerical diagonalization of the quantum evolution and find that although the treatment leads to a smoothening and a slight shift of the transitions in the system, it still provides a clear improvement over localized semiclassical approximations.

**BIOGRAPHY**

Alan Kahan is in the final year of PhD studies at the National University of Córdoba, Argentina, under the supervision of Prof Cecilia Cormick. His main interests are cold atom systems, the theory of open quantum systems particularly out-of-equilibrium, and quantum information theory. During his PhD, he studied analytically and numerically trapped ions coupled to optical cavities.

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