

SEMINAR

High-temperature limit penalising high-frequency quantum fluctuations

Dr Graeme Pleasance (Stellenbosch University)

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Venues: NITheCS Seminar Room, Stellenbosch University; and online

ABSTRACT:

The study of quantum Brownian motion has spanned several decades and offered fundamental insights into dissipation in open quantum systems. Within the semiclassical limit, Markovian quantum Brownian motion is adequately described by the Caldeira-Leggett master equation, which is famously known to be in non-GKSL form.

In this talk, I will discuss a new approach to quantum Brownian motion in which an additional contribution to the decoherence kernel is derived in a new high temperature limit. This contribution is shown to reveal a novel mechanism for the classicalisation of high-frequency quantum fluctuations. I will also demonstrate that it leads to a Markovian master equation in guaranteed GKSL form, and argue that this master equation describes the correct Markovian limit of quantum Brownian motion.

BIOGRAPHY:

Graeme Pleasance is a postdoctoral researcher in the Quantum@SUN group at Stellenbosch University, led by Prof Francesco Petruccione.

He graduated with an MSci in Theoretical Physics from the University of Birmingham in 2013 and received his PhD from the University of Sussex in 2018. From 2018 to 2022, he held a postdoctoral research position in the Quantum Research Group at the University of KwaZulu-Natal. His research interests lie broadly in the theory of open quantum systems, quantum thermodynamics and quantum information.

Currently, he is working on the development of nonperturbative techniques for treating strongly coupled open quantum systems, with applications to nonequilibrium thermodynamics. He is due to join the Statistical Physics Group at Coventry University in the UK, in September.



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