

Speaker. Steve Campbell.

Room. SA106.

Date. 19th March 2020.

Time. 1pm.

Title.

Quantum speed limits: Practical tool. Fundamental Insights

Abstract.

Uncertainty lies at the very heart of quantum mechanics. This notion is mathematically captured by the famous indeterminacy principles laid out by Heisenberg in 1927. One does not need to be a physics student to have come across the position-momentum uncertainty principle, while less well known is the energy-time (E-T) formulation. A remarkable outcome from the E-T uncertainty principle is the quantum speed limit, which uses the basic tenets of quantum mechanics to bound the minimal time a quantum system needs to evolve between two distinct states. In the last decades the study of the quantum speed limit has enjoyed a renewed interest, partially driven by the rapid development of quantum technologies and quantum thermodynamic devices, where a minimal time sets the ultimate bounds on efficiency. Thus, the QSL provides a practical tool for the design of optimal quantum devices. However, considering its origins, it is not surprising that recently there has been a growing interest in exploring how the quantum speed limit can provide some fundamental insights into the dynamics of quantum systems. The goal of this seminar is to introduce the basic aspects of quantum speed limits and provide some examples of their broad utility.

Bio.

Steve Campbell is a theoretical physicist interested in exploring the role which fundamental bounds, such as the quantum speed limit, play in characterising and designing thermodynamically efficient control protocols for complex quantum systems. He works on a variety of topics including open quantum systems, critical spin systems and phase transitions, metrology, and coherent control. After a PhD in Queen's University Belfast in 2011 under the supervision of Mauro Paternostro, Steve moved to University College Cork to work with Thomas Busch in 2012. 2013 was spent at the Okinawa Institute of Science and Technology Graduate University in Japan. Returning to Belfast he spent 2014 through to 2016 back at Queen's University. In 2017 he was awarded a fellowship from the INFN Sezione di Milano and worked with Bassano Vacchini. From February to September 2019 he was a Senior Research Fellow at Trinity College Dublin through the award of an SFI Starting Investigators Research Grant for a project on Quantum Speed Limits in Thermodynamic Processes and moved to UCD in October 2019.