



Nicolino LE GULLO

From Finland to France



Project: **Quantum technologies and quantum devices**

Research topic: **Physics**

Finnish Institution: **Turku University**

French Institution: **CNRS Institut Neel Grenoble**

Dates of mobility: **26/09/2022 to 30/09/2022**

Program: **Maupertuis Programme**



PRESENTATION

[Nicolino Lo Gullo](#) graduated at the [Università della Calabria](#) in Italy in 2009 and then moved to the [University College Cork](#) in Republic of Ireland where he obtained his PhD in Theoretical Physics. He then held two postdoctoral positions until he was awarded in 2017 by the [Turku Collegium for Science and Medicine](#) a three years personal fellowship to join the group of [Prof. Sabrina Maniscalco](#). His main research interests include out-of-equilibrium systems, transport in complex geometries, numerical methods for many-body systems, open quantum systems.

ACTIVITIES IN FRANCE

During his stay, Nicolino Lo Gullo's work aimed to study the validity of the so-called Wiedemann-Franz law which links charge and heat currents in metals. It has been shown that in a specific setup the Wiedemann-Franz law is violated and this is known to open the possibility of handling separately the heat and charge currents. During the visit they reviewed the theoretical approach to explain the obtained phenomenon and performed some checks of the different regime of validity of the theory. The outcome led to improve the theoretical explanation adding interaction between the electrons flowing in the quantum dot. They discussed about a follow up work to study how the heat current can be defined in nanoscale systems when an external driving potential is applied. This is particularly relevant in technological applications where time dependent switches in nano-electronic systems are common. Understanding how heat flows in this transient phases is crucial to design devices where overheating can be controlled.

Finally, the possibility of a joint participation to a Doctoral training network of the [Marie-Sklodowska Actions](#) has been discussed. The group in Grenoble has already successful experience with this type of calls and they thought of submitting a new one.