





## PhD GRANTS 2024

**PhD project title:** Quantum-to-classical transition from quantum signals: reconstructing a classical picture from a network of observers

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## PhD project summary (max. 20 lines):

The measurement problem and the quantum-classical transition have become crucial with the recent developments of quantum technologies. The traditional approach of decoherence, which remains the essential physical ingredient for understanding the emergence of the classical world, fails to consider that multiple observers can probe a system, and that these observers have limited resources. While research on quantum Darwinism addresses this aspect, the question of reconstructing a classical image, if it exists, remains unclear. Conversely, the same decoherence is a major phenomenon to control or eliminate to harness the technological advantages offered by quantum information.

The project aims to explore the role of the physics of observers (for instance what type of signals, which measurements) by viewing decoherence through the lens of experimentally measured signals (circuit electrodynamics, quantum electron optics) and finite-resources quantum information. The objectives include:

- 1. A method to infer information about a system through measured signals.
- 2. A way to characterize multipartite entanglement via measured signals.

Establishing, through quantum information theory, quantitative criteria characterizing decoherence and the observers' capacity to reconstruct a classical image of the system.