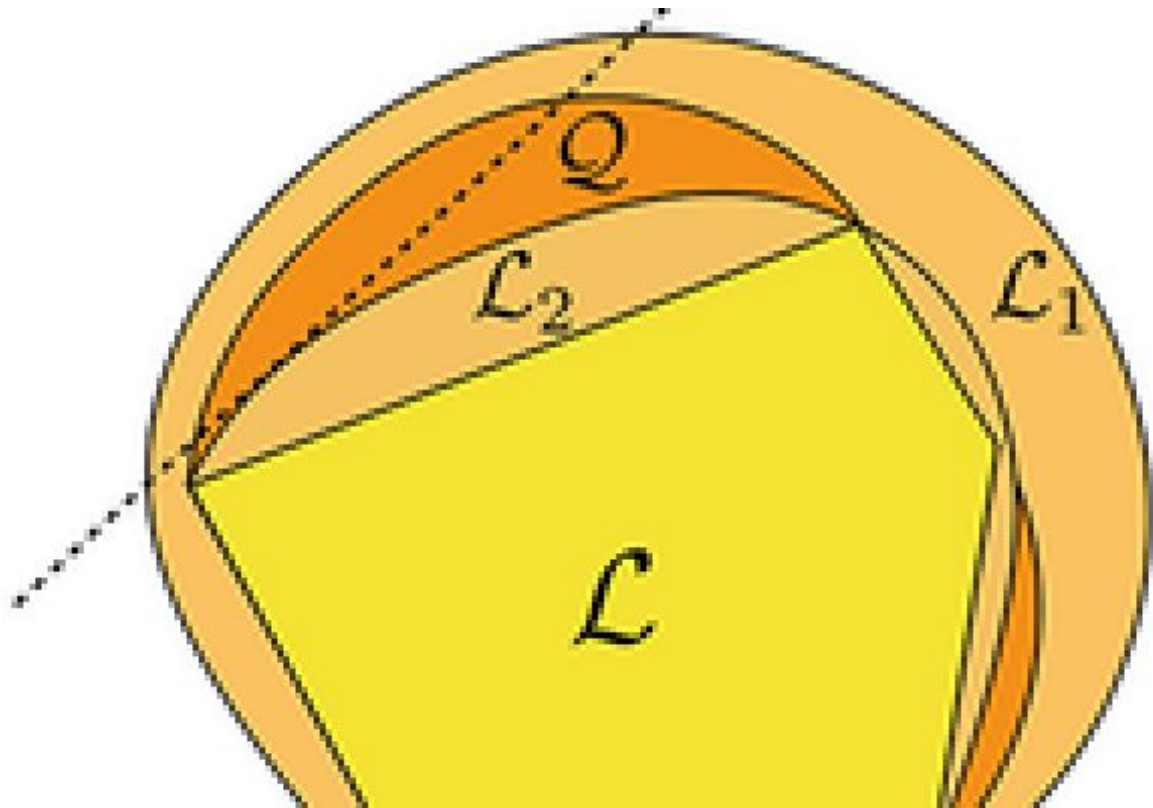




Efficient Device-Independent Entanglement Detection for Multipartite Systems

New approach for detecting entanglement in experiments involving tens of particles

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Entanglement is a set of correlations observed among quantum particles that does not have a classical analog. It is also a key feature for several quantum information protocols. Detecting its presence in systems with many particles, however, remains experimentally and theoretically challenging. The first barrier is the exponential amount of information required to reconstruct the system's state. The second is that, even if the quantum state is known, the available methods are computationally too demanding even for systems composed of few particles. In a paper recently published in *Physical Review X*, researchers Flavio Baccari, Daniel Cavalcanti and Peter Wittek led by ICREA Prof at ICFO Antonio Acin introduce a technique for entanglement detection that is both computationally and experimentally efficient.

Their method, which relies on the detection of nonlocality, involves a number of experimental configurations that grow only polynomially with the size of the system, which makes it applicable to states of up to a few tens of particles. Moreover, it is based on the knowledge of few-body correlators, making it amenable to practical implementation. Lastly, their method is device independent, meaning that it allows one to assess entanglement without assuming any prior knowledge of the prepared state or the measurements performed.

Researchers expect that their findings will contribute to advancing the field of entanglement detection towards larger systems. In particular, this new approach can supersede the current methods used to detect entanglement in state-of-the-art experiments involving tens of particles.