

Generation of Wigner-negative states from a coherently driven qubit in waveguide

Monday 15 December 2025 16:42 (12 minutes)

In this talk, we will present a powerful protocol, employing the interaction between an electromagnetic field and a qubit, to identify genuinely non-classical states, and we will explain the assumptions underlying this protocol. To discriminate non-classical states from classical ones, we choose the Wigner function as our diagnostic tool.

We will show how to analyze light-matter interaction without relying on standard open-quantum-system models, in order to obtain information about the light states. In particular, we will use the Virtual Cavity Method, which allows for the direct extraction of the states of selected modes of the field scattered by the emitter, and the Collision Model, which provides an analytical, time-resolved description of the closed emitter-field dynamics.

We then compare and combine the predictions of the two models, exploring how system parameters affect the Wigner function. The main objective is to identify optimal working points for this protocol which generates non-classical states, given the importance of this kind of resources for the development of quantum technologies.

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