Experimental quantum reading with photon counting

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In this presentation, I am going to present our recent results on quantum reading [1], focusing in particular on the experimental implementation realized in our labs. Quantum reading is part of the vast panorama of quantum technologies, and more specifically of quantum hypothesis testing. Its goal is to decode a bit of information stored in a memory cell (e.g. as two discrete levels of absorption) using signals and idlers modes and an opportune generally joint measurement between them, with the minimum possible error probability. In our work we demonstrate, both theoretically and experimentally, how using quantum states of light (i.e. a two mode squeezed vacuum state) and a simple photon counting strategy it is possible to outperform any classical strategy, for the same number of input photons. In our experiment, we consider the realistic scenario where only a single output from the cell is accessible for detection and we show quantum advantage despite the presence of extra optical losses on both the signal and idler paths. Our results pave the way for a realistic and practical implementation of quantum reading techniques, whose implications go beyond the memory model discussed here.

[1] Ortolano, Giuseppe, et al. "Experimental quantum reading with photon counting." Science Advances 7.4 (2021): eabc7796.