Optical quantum computing with solid-states quantum light emitters

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Optical quantum computing has been shown to present several fundamental advantages compared to other approaches [1], mostly for its built-in connectivity and for the possibility to leverage well established technologies, like the photonic & telecom industry combined with the capability of large fabrication of integrated photonic circuit in top-tier foundries.

Full monolithic designs [2,3] have been proposed but the type of probabilistic qubit generators implemented, require complex resources parallelization and large processed wafer surfaces uniquely for efficient single-photon generation; the approach requires fabrication challenges, structure complexity and increasing amount of needed resources to scale the number of qubits.

By implementing solid-state sources of quantum light which can provide near-deterministic single-photon generation [4] we develop modular quantum computing platforms which are intrinsically interconnected and guarantee low resource complexity while scaling the computing power. Besides, the possibility of cluster states generation from a single device [5,6] permit to develop architectures which fully exploit the scalability of measurement-based quantum computing approaches.

In the talk I present the technology implemented in Quandela, and show examples of first quantum computing machines; I will also present some examples of protocols and software developed to provide the additional layers required to operate such QC machines.

References

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Figure

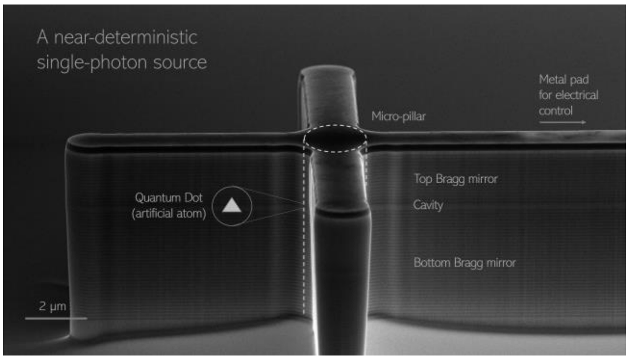

Figure 1: Solid-state quantum light source developed by Quandela