Bridging single photon emitters with nanofibers and integrated optics

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In the last years, the interest on quantum technologies by the scientific community and the industries has increased. Theoretical studies show that the peculiar characteristics of quantum mechanics could be used to simulate other quantum systems, to safely encrypt communications and efficiently compute problems that requires an exponential computation time for a classical Turing machine.

Different types of platforms have been proposed for the practical implementation of a quantum bit as trapped atoms, ions and single photons. In particular single photons have the peculiarities to be intrinsically quantum and easy to manipulate. Guided light offers an easy and robust way to create quantum circuits. In this context two different platforms appear very promising, the nanofibers and the ion-exchange glass waveguides (IEW). In both of them the single photon and the guided modes are coupled trough the near-field interaction and, in the case of the IEW, this coupling can be enhanced via some plasmoinc antennas (as shown in Figure 1).

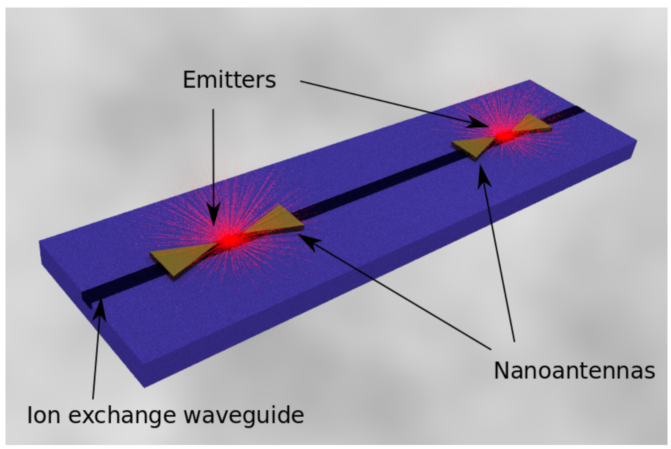

Figure 1: Example of a possible realisation of integration of two photon emitters on a waveguide

The goal of my work is to study and optimize the integration of single photon emitters with ion-exchange glass waveguide (IEW) and nanofibers. This will allow having the photons directly coupled on guided versatile platform. The study of NV-centers in nanodiamonds give a robust single photon source to be used in this platforms.

In my contribute I will show the first results I had and the future challenges of the project, with a focus on the bridging of NV-centers in nanodiamonds with nanofibers.

References

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