Heterogeneous Integration and Co-Integration of Single-Photon Sources

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State-of-the-art single photon sources are currently realized using In(Ga)As quantum dots embedded in GaAs waveguides[1]. While these sources exhibit excellent performance in terms of coherence and indistinguishability of the emitted photons, the platform suffers from significant propagation and fiber-coupling losses, which limit scalability for large-scale integrated quantum photonic circuits. Here, we demonstrate their reliable heterogeneous integration onto a low-loss SiN platform[2]. We demonstrate scalable, high yield fabrication that for the first time includes also proper electrical tuning and control through a p-i-n junction. By exploiting the pick-and-place nature of micro-transfer printing, we even go one step further and also demonstrate co-integration with LN racetrack filters[3] on the same SiN interposer. A microscope picture of the result is shown in Figure 1. This directly addresses the significant coupling losses inherent to typical modular systems comprised of multiple photonic integrated circuits that are connected through many fiber-to-chip interfaces.

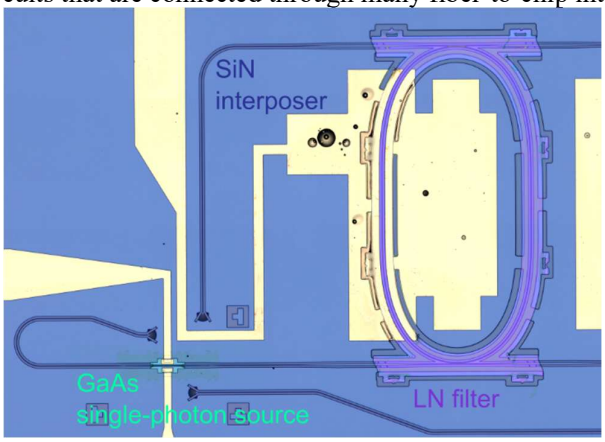

Fig. 1: *Microscope image of the SiN circuit including the GaAs single-photon source and LN filter.*

This achievement opens up new avenues for advanced quantum photonic experiments.

Funding acknowledgement

We acknowledge the support by Fonds Wetenschappelijk Onderzoek (FWO) grant 1S69123N as well as the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (No. 949043, NANOMEQ)

References

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