Diamond Nanophotonic Circuits

W. Hartmann, P. Rath, and W. H. P. Pernice

Abstract Ordinary quantum optic experiments often reach a very high complexity very quickly, filling up whole optical tables with free space optic components. Integrating quantum optics on a nanophotonic chip not only reduces the size of a normally several square meters sized experiment to a few millimeters, but also provides high scalability and stability. One very promising material for such nanophotonic circuits is thin-film diamond due to its relatively high refractive index of 2.4 and very high Young's modulus of around 1100 GPa. Therefore, we present a complete approach for quantum applications based on diamond nanophotonic circuits, comprising single photon sources, superconducting single photon detectors and optomechanical phase-shifters.

References

1. Rath P (2013) Diamond-integrated optomechanical circuits. Nat Commun 4:1690
2. Rath P (2014) Diamond electro-optomechanical resonators integrated in nanophotonic circuits. APL 105:251102
3. Peruzzo A (2014) A variational eigenvalue solver on a photonic quantum processor. Nat Commun 5:4213
4. Poot M (2014) Broadband nanoelectromechanical phase shifting of light on a chip. APL 104:061101

W. Hartmann (✉) · W. H. P. Pernice
Institute of Physics, University of Münster, Münster, Germany

CeNTech – Center for Nanotechnology, University of Münster, Münster, Germany
e-mail: wladick.hartmann@uni-muenster.de

P. Rath
Qorvo Inc., Greensboro, NC, USA