

Seminar über Quanten-, Atom- und Neutronenphysik (QUANTUM)

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None

Prof. Ilja Gerhardt
Leibniz Universität Hannover

Cool Experiments with Hot Atomic Vapors

The past decade has seen a resurrection of experiments with hot atomic vapors. Their physics covers atomic clocks, magnetic and electric sensing and optical devices. In parallel the field of quantum technology develops ever better single photon sources and quantum sensing devices at the nano-scale. Our own efforts of combining both techniques started with single photon slow light experiments. [1,2]. They evolved towards the optimization of Faraday filters [3,4,5], and took the baby-steps towards storing a single photon into hot atomic vapor with Rydberg transitions [6]. With the technology at hand, we further aimed for the combination of solid-state samples with atomic vapors. This can be envisioned in a sensing setting [7] – but also other coupling schemes can be envisioned.

In this talk I will review the prospects and challenges for combining single photon sources with hot atomic vapors. The valuable tool of atomic filtering and its combination with quantum optics will be explained and reviewed.

References

- [1] Molecular photons interfaced with alkali atoms
Petr Siyushev, Guilherme Stein, Jörg Wrachtrup, Ilja Gerhardt
Nature, 2014, 509, 66-70
- [2] Two-photon interference in an atom-quantum dot hybrid system
Hüseyin Vural, Simone L. Portalupi, Julian Maisch, Simon Kern, Jonas H. Weber, Michael Jetter, Jörg Wrachtrup, Robert Löw, Ilja Gerhardt, Peter Michler
Optica, 2018, 5, 367-373
- [3] Na-Faraday rotation filtering: The optimal point
Wilhelm Kiefer, Robert Löw, Jörg Wrachtrup, Ilja Gerhardt

Scientific Reports, 2014, 4, 6552

[4] Simultaneous Faraday filtering of the Mollow triplet sidebands with the Cs-D1 clock transition

Simone Luca Portalupi, Matthias Widmann, Cornelius Nawrath, Michael Jetter, Peter Michler, Jörg Wrachtrup, Ilja Gerhardt

Nature Communications, 2016, 7, 13632

[5] How anomalous is my Faraday filter?

Ilja Gerhardt

Optics Letters, 2018, 43, 5295-5298

[6] Two Step Excitation in Hot Atomic Sodium Vapor

Bernd Docters, Jörg Wrachtrup, Ilja Gerhardt

Scientific Reports, 2017, 11760

[7] A Rubidium Mx-magnetometer for Measurements on Solid State Spins

Daniel Arnold, Steven Siegel, Emily Grisanti, Jörg Wrachtrup, Ilja Gerhardt

Review of Scientific Instruments, 2017, 88, 023103