Characterizing the local vectorial electric field near an atom chip using Rydberg-state spectroscopy

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https://doi.org/10.1103/PhysRevA.96.013425 [2]

We use the sensitive response to electric fields of Rydberg atoms to characterize all three vector components of the local electric field close to an atom-chip surface. We measured Stark-Zeeman maps of S and D Rydberg states using an elongated cloud of ultracold Rubidium atoms (T ~2.5 μK) trapped magnetically 100 μm from the chip surface. The spectroscopy of S states yields a calibration for the generated local electric field at the position of the atoms. The values for different components of the field are extracted from the more complex response of D states to the combined electric and magnetic fields. From the analysis we find residual fields in the two uncompensated directions of 0.0 +/- 0.2 V/cm and 1.98 +/- 0.09 V/cm respectively. This method also allows us to extract a value for the relevant field gradient along the long axis of the cloud. The manipulation of electric fields and the magnetic trapping are both done using on-chip wires, making this setup a promising candidate to observe Rydberg-mediated interactions on a chip.

- H2020 [3]
- QIPC [4]
- RySQ [5]
- Result [6]
- 15.10.Ry Rydberg atoms [7]

Links:
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