

Nanostructured Alkali-Metal Vapor Cells and Simultons

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Atom-light interactions in micro-and nanoscale systems hold great promise for alternative technologies based on integrated emitters and optical modes. We present the design architecture, construction method, and characterization of an all-glass alkali-metal vapor cell with nanometer-scale internal structure [1]. Our cell has a glue-free design that allows versatile optical access, in particular with high numerical aperture optics, and incorporates a compact integrated heating system in the form of an external deposited indium tin oxide layer. By performing spectroscopy in different illumination and detection schemes, we investigate atomic densities and velocity distributions in various nanoscopic landscapes.

Future experiments on simultons [2] are planned.

[1] T.F. Cutler, W.J. Hamlyn, J. Renger, K.A. Whittaker, D. Pizzey, I.G. Hughes, V. Sandoghdar, and C.S. Adams, *Phys. Rev. Applied* 14, 034054 2020.

[2] Thomas P. Ogden, K.A. Whittaker, J. Keaveney, S. Wrathmall, C.S.Adams, and R.M.Potvliege, *Phys. Rev. Lett.* 123, 243604 2019.