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Rydberg atoms inside hollow-core photonic crystal fibres ROBERT LÖW, GEORG EPPLE, KATHRIN KLEINBACH, University of Stuttgart, TIJMEN EUSER, NICOLAS JOLY, Max Planck Institute Erlangen, TILMAN PFAU, University of Stuttgart, PHILIP RUSSELL, Max Planck Institute Erlangen — Rydberg atoms have peculiar properties as enhanced sensitivities to AC/DC electric fields or exaggerated strong interactions between them, leading to optical nonlinearities on the single photon level. These properties are mostly studied with spectroscopic methods often limited by the free space diffraction limit. This can be avoided by confining Rydberg atoms inside hollow core fibres offering a perfect match of guided light modes with the atomic gas in terms of atom-light coupling. Additionally we choose Kagome type fibres due to their extremely thin structures, promising a reduced atom wall coupling. With coherent three photon spectroscopy we can show that Rydberg atoms can be excited within these fibres up to states of n=46 without severe perturbations by the fibre environment.

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