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Crossed fiber cavities with single trapped atoms DOMINIK NIEMIETZ, PAU FARRERA, Max Planck Institute of Quantum Optics, MANUEL BREKENFELD, Menlo Systems GmbH, JOSEPH DALE CHRISTESEN, National Institute of Standards and Technology, GERHARD REMPE, Max Planck Institute of Quantum Optics — Single atoms strongly coupled to the optical mode of high-finesse, fiber-based Fabry-Perot cavities (FFPCs) represent a progressing system in the field of quantum information processing. FFPCs allow for small mode volumes[1] [2] which increase the atom cavity mode coupling strengths and enable new cavity geometries due to the small lateral size of the mirrors. We have set up a new cavity experiment that exploits the experimental advancement of high coupling strength and small mirror size. A single neutral atom is trapped at the center of two crossed FFPCs. Each cavity mode can be independently tuned to an atomic transition which enables the implementation of quantum information schemes based on two-mode cavity QED. We will present in detail the cavity fibers fabrication results, the assembly of the experimental setup, the atom loading scheme and the atom imaging system. Furthermore, we show data that proves strong coupling between single atoms and both cavity modes for long trapping times and the coherent microwave manipulation of the atomic states.

[1]Hunger et al., **New J. Phys.** 12, 065038 (2010)
[2]Uphoff et al., **New J. Phys.** 17, 013053 (2015)

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