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Quantum technology enabled by metalens-trapped single atoms and hot vapor cells TING-WEI HSU, JILA, University of Colorado at Boulder, TOBIAS THIELE, JILA, WENQI ZHANG, AMIT AGRAWAL, NIST, MARK BROWN, CHRIS KIEHL, JILA, University of Colorado at Boulder, CINDY REGAL, JILA, NIST, University of Colorado at Boulder — We present two recent experiments in the control of single atoms and quantum sensing technology. First, we present advances on generating high NA optical tweezers with dielectric metasurfaces and on trapping of single atom in associated tightly focused traps. With this new technique we are creating a high NA 0.9 optical tweezer with a working distance of 0.7 mm. In contrast to traditional optics, metasurfaces modify the wavefront of the light through a resonance condition of the surface nanostructure. This enables UHV compatible and high NA optics that have essentially zero thickness. In addition, we present experimental results and progress toward creating a sensitive absolute vector magnetometer with atoms. We first determine the polarization ellipse of a microwave field in a self-calibrated way, and then reference an unknown magnetic probe field to this three-dimensional object. Combining this with atoms in hot-vapor cell in a microwave cavity we can create a versatile high sensitivity vector magnetometer.

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None

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