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Strong field radio-frequency measurements using Rydberg states in a vapor cell STEPHANIE MILLER, University of Michigan, DAVID ANDERSON, Rydberg Technologies, LLC, GEORG RAITHEL, University of Michigan — There has been a growing interest in using electromagnetically induced transparency with Rydberg atoms in a room-temperature vapor cell as an all-optical readout method for measuring microwave electric fields [1, 2]. We present results from RF-modulating the $60S_{1/2}$ and $58D_{5/2}$ Rydberg states of rubidium with 50 MHz and 100 MHz fields, respectively [3]. Weak RF fields AC Stark-shifts the Rydberg states. As the field strength is increased, sidebands appear at even multiples of the driving frequency. When strong fields are applied, the nearby hydrogenic manifold begins to intersect with the shifted levels. Similar investigations have been performed in cesium [4]. Due to the significant amount of state mixing and level structure, Floquet theory is required to describe the level shifts and mixing. By comparing the calculation with the experimental data, we obtain an absolute determination of the RF electric field reaching a maximum field of 296 V/m to within ±0.35%. Additionally, we estimate the shielding of DC fields within the vapor cell. [1] D. A. Anderson et. al., arXiv: 1601.02535 [2] J. A. Sedlacek et. al., Nat. Phys. 8, 819 (2012). [3] S. A. Miller, D. A. Anderson, G. Raithel, arXiv: 1601.06840 [4] Y. Jiao et. al., arXiv: 1601.01748

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