Abstract Submitted
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Photoexcitation of high-n, $n \sim 300$, Rydberg states in the presence of an rf driving field near the final Kepler frequency[1] S. YE, X. ZHANG, F.B. DUNNING, Rice University, S. YOSHIDA, J. BURGDÖRFER, Vienna University of Technology — The photoexcitation of very-high-n, $n \sim 300$, potassium Rydberg atoms in the presence of an rf driving field at, or near, the Kepler frequency of the final state is examined and allows the realization of quantum-optical protocols in truly mesoscopic atoms. When directly exciting 4s $\rightarrow$ np transitions using a uv laser, application of the drive field leads to the appearance of new features in the excitation spectrum that lie approximately midway between the np states. Whereas the size of these features increases with increasing drive field amplitude their positions remain largely unchanged. As the rf frequency is detuned from resonance, the features split, the separation of the components being equal to twice the detuning. The new features are attributed to multiphoton transitions to final ns and nd states that involve the absorption or emission of rf photons. Measurements further suggest that while the electron motion in the product states is locked to the drive field this results from post-excitation interactions with the field rather than the excitation process *per se*. The results are analyzed using Floquet theory.

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