Millimeter Wave Spectroscopy of cold Rb Rydberg atoms

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University of Virginia — By using the cold $^{85}\text{Rb}$ Rydberg atoms in a magneto optical trap, we have measured the single photon $^{85}\text{Rb} n-d-(n-2)f$ millimeter wave transitions for $32 \leq n \leq 39$. The measurements were carried out at densities of $10^9$ atoms/cm$^{-3}$, roughly five orders of magnitude lower than those used in optical measurements. Since the 10 G/cm gradient of the trap magnetic field would result in 5 MHz wide resonances, we switched off the field during the measurements. The observed narrow resonances will be used to improve the accuracy of the $f$ quantum defect of $^{85}\text{Rb}$.

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