New source for tuning the effective Rabi frequency discovered in multiphoton ionization

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The Autler-Townes effect [1] due to near resonance transition between 4s-4p states in potassium atoms is mapped out in the photo-electron-momentum distribution and manifests itself as a splitting in the photo-electron kinetic energy spectra. The energy splitting fits well with the calculated Rabi frequency at low laser intensities and shows clear deviation at laser intensities above 1.5×10^{11} W/cm^2. An effective Rabi frequency formula including the ionization process explains the observed results as shown in fig 1. Our results reveal the possibility to tune the effective coupling strength with the cost of the number of level-populations.

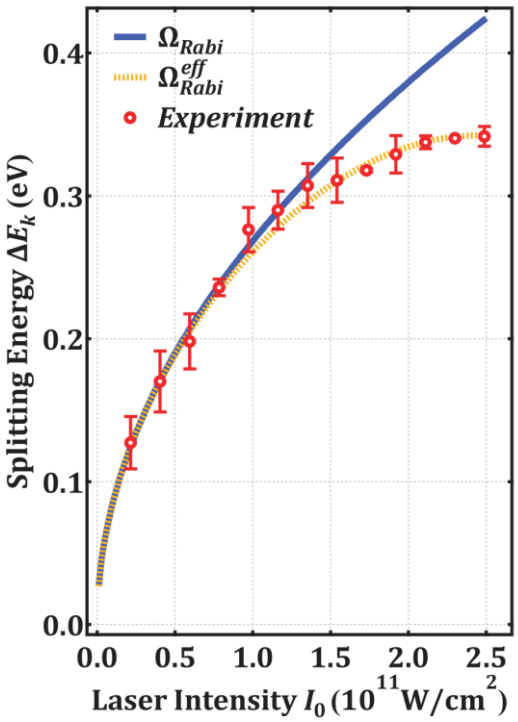

Fig 1. The energy separation of the Aulter-Townes splitting as a function of laser intensities. The red dots represent the experimentally measured kinetic energy difference of the photoelectron originated from the AT-doublets. The error bar is the statistical error from ten individual measurements. The blue line is the Rabi frequency. The orange broken line is the effective Rabi frequency taken ionization into account.

References:

1. Autler, S. H. & Townes, C. H. Stark Effect in Rapidly Varying Fields. *Phys. Rev.* **100**, 703–722 (1955).