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Resonant Two-Photon Ionization of Neon via the 3d Intermediate State

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Abstract

We study the resonant two-photon ionization of neon atoms starting from the 3d intermediate state, using XUV pulses combined with infrared (IR) laser fields. The dynamics of the population transfer through the 3d state are analyzed by solving the time-dependent Schrödinger equation numerically [1]. We investigate the influence of IR intensity and frequency detuning on the resulting photoelectron energy spectra. Momentum distributions of the ejected electrons are computed to reveal angular dependencies and interference effects between resonant and non-resonant ionization pathways. The calculated spectra and momentum distributions are systematically compared with available experimental measurements reported by Villeneuve and co-workers[2]. A good qualitative agreement is obtained, supporting the validity of our theoretical model and confirming the crucial role of the $3d$ intermediate resonance in shaping the photoelectron dynamics. These results provide theoretical support for attosecond pump–probe experiments and demonstrate the possibility of controlling resonant ionization pathways in neon by tuning the IR field parameters. The present approach can be extended to other noble gases exhibiting similar resonant structures.

References

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