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Author

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Free-free experiments: dressed-atom effects during inelastic electron scattering

N L S Martin^{1*}, B N Kim^{1†}, C M Weaver¹ and B A deHarak²

¹Department of Physics and Astronomy, University of Kentucky, Lexington, Kentucky 40506-0055, USA

²Physics Department, Illinois Wesleyan University, P.O. Box 2900, Bloomington, IL 61702-2900, USA

Synopsis Experiments and theory will be presented for the emission/absorption of 1.17 eV photons by electrons during the electron-impact excitation of a helium target in a laser field.

Free-free experiments investigate the absorption or emission of radiation during the collision of charged particles with atoms and molecules. The first experimental observation of dressed-atom effects – due to the electric field of the laser – during the elastic scattering of electrons by Xe were reported by Morimoto *et al* [1]. Their results were compared with an analytical expression by Zon that contains the electric dipole polarizability α of the target [2]. We are investigating dressing effects for *inelastic* electron scattering in the presence of a Nd:YAG laser; specifically we are investigating electron-impact excitation of the lowest excited states of He and Ar. Zon's expression is not valid for inelastic scattering so we have developed an equivalent inelastic expression. We will give the results of a simple calculation for dressing effects for the excited states of He (see Figure 1), and will give

a progress report on our experiments.

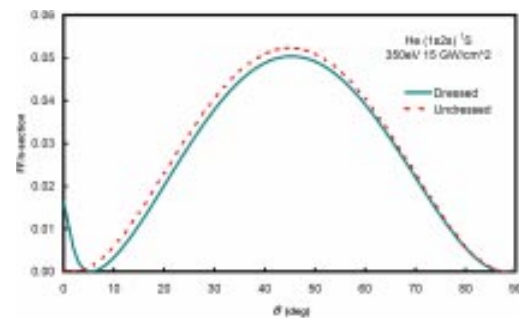


Figure 1. Calculated free-free signal for the excitation of He ($1s2s$) 1S by 350 eV electrons. The solid (green) curve includes the dressing of the atom by the 1.17 eV laser field, the dotted (red) curve does not.

References

- [1] Morimoto Y, Kanya R and Yamanouchi K 2015 *Phys. Rev. Lett.* **115** 123201
- [2] Zon B A 1977 *Sov. Phys. JETP* **46** 65

*E-mail: nmartin@uky.edu

†E-mail: brian.kim@uky.edu