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Complex polarizabilities of atoms and ions MICHAEL BROMLEY, SWAANTJE GRUNEFELD, School of Mathematics and Physics, The University of Queensland, Australia, JULIA ROSSI, Department of Physics, San Diego State University, U. S. A., LI-YAN TANG, Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, Wuhan, P. R. China, YONGJUN CHENG, Harbin Institute of Technology, P.R. China, JUN JIANG, Northwest Normal University, P. R. China, JULIAN BERENGUT, University of New South Wales, Australia, JIM MITROY[1], School of Engineering, Charles Darwin University, Australia — The complex dipole polarizabilities of neutral alkali atoms are computed for several low-lying eigenstates. We present a unified view of the frequency dependence of the complex polarizabilities spanning below and above the various ionization thresholds as well as through the Rydberg transitions. We have adapted the methodology previously developed by Langhoff and collaborators that uses the pseudostate energy spectrum and wavefunctions to describe the above threshold physics. This enables the real part of the polarizability to be computed as well as simultaneously computing two different contributions to the imaginary part of the polarizability. The absorption polarizability is related to the photoabsorption cross-section both below and above threshold, whilst the ionization polarizability describes the photoionization cross-section above threshold. We also present an extension the Langhoff method to calculations of the complex hyperpolarizabilities of atoms and ions that describes how atomic clocks are impacted by the non-linear optics of light-atom interactions.

[1]This work is dedicated to our colleague and mentor Jim Mitroy who recently passed away.

Michael Bromley
The University of Queensland

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