

Abstract Submitted  
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**Calculation of inner-shell photoionization of ground state Na: relativistic vs. nonrelativistic calculation**<sup>1</sup> H.-L. ZHOU, S.T. MANSON, Georgia State University, A. HIBBERT, Queen's University of Belfast — Calculations of inner-shell photoionization of ground state Na over the photon energy range 40-100 eV have been performed using nonrelativistic LS coupling and relativistic Breit-Pauli (BP) R-matrix approximations. The BP R-matrix calculation adds the spin-orbit, mass-correction and Darwin terms to the non-relativistic Hamiltonian in order to include relativistic effects, giving 111 J-dependent states of Na<sup>+</sup> from 61 LS states; the same target orbitals are used for both calculations. The calculated energy of ground state of Na is 5.1606 eV in LS coupling and 5.1756 eV in BP approximation ( NIST value is 5.14 eV). We find that in the neighborhood of the broad 2s→np resonances, the results of LS and BP calculations are almost same, but in the neighborhood of narrow doubly-excited  $2p^5nl'n'l'$  resonances, the BP calculations show spin-orbit splittings and differ significantly from the LS coupling results.

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H.-L. Zhou  
Georgia State University

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