Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

A Fully Relativistic Approach for Calculating the Top-Up Contribution to Electron-Impact Excitation Cross Sections for Transitions between Magnetic Sublevels CHRISTOPHER J. FONTES, HONG LIN ZHANG, Los Alamos National Laboratory — Previous work on relativistic electron-impact excitation calculations has been expanded to include transitions between magnetic sublevels. Specifically, a general expression has been derived for the relativistic plane-wave-Born (RPWB) cross section for electron-impact excitation between magnetic sublevels. This expression provides a convenient, accurate mechanism for estimating the high-ℓ partial-wave (or top-up) contribution to the corresponding relativistic distorted-wave (RDW) cross sections. This approach offers significant advantages over previous attempts to approximate the top-up contribution for RDW cross sections. For example, the RPWB top-up is fully relativistic and incorporates the correct kinematic description for relativistic collisions. Also, the RPWB approach is completely general in that it is applicable to any type of transition, while previous attempts employed the relativistic Coulomb-Bethe (RCB) approximation, which is valid only for dipole-allowed transitions. Another issue is that the RCB approach often converges slowly for Δn=0 transitions, while the RPWB approach always produces a converged result because it includes contributions from ℓ values up to infinity. Numerical examples will also be provided. This work was performed under the auspices of the US Department of Energy.

Christopher J. Fontes
Los Alamos National Laboratory

Date submitted: 05 Feb 2007 Electronic form version 1.4