Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

Accurate calculations of the relativistic rise in electron-impact excitation cross sections for highly charged ions[1] CHRISTOPHER J. BOSTOCK, DMITRY V. FURSA, IGOR BRAY, Curtin University, CHRISTOPHER J. FONTES, HONG LIN ZHANG, Los Alamos National Laboratory — Exact relativistic plane-wave Born (RPWB) matrix elements of the Møller interaction are incorporated in the "analytic Born subtraction technique" and employed in the Relativistic Convergent Close-Coupling (RCCC) method. Application to the calculation of high-energy electron-impact excitation cross sections of highly charged hydrogen-like ions demonstrates the "Bethe rise", an effect that is manifest in Bethe's original 1932 work [1] on relativistic high-energy, electron-impact excitation. The result represents an improvement over Bethe's relativistic high-energy theory developed in the 1930's in that (i) both target and projectile electrons are represented relativistically with Dirac spinor wavefunctions and (ii) the dipole approximation plus additional assumptions are not employed in the RPWB scattering amplitude of the Møller interaction. We show that as the Z of the target increases, the onset of the rise occurs at lower, absolute projectile energies. The onset occurs at significantly lower energies, when expressed in threshold units, as Z increases, which could have important consequences for the collisional-radiative modeling of high-Z plasmas.

[1] H. Bethe, Z. Phys. 76, 293 (1932).

[1]Supported by the Australian Research Council and U.S. Department of Energy

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Date submitted: 13 Jun 2013 Electronic form version 1.4