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Scaling of plane-wave Born cross sections for electron-impact excitation of neutral atoms and molecules

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We review the scaling of plane-wave Born cross sections for electron-impact excitation of neutral atoms and molecules. The scaling method is applied to integrated cross sections for electric dipole-allowed transitions. As introduced in the BEB scaling model for ionization cross sections, this scaling replaces the incident electron energy T in the first-order PWB cross sections by $T + B + E$, where B is the ionization energy, or the binding energy, of the target electron, and E is the excitation energy. Note in a generic form, first-order PWB cross sections are defined as $\sigma_{PWB} = (4\pi a_0^2 R/T)\ \mathrm{GOS}_{PWB}(T)$, where a_0 is the Bohr radius, R is the Rydberg energy, and GOS is the *Bethe* generalized oscillator strength. In the scaling, though two approaches, computational and experimental have been applied, the latter is presented at this meeting in which the *Bethe* GOS is replaced by the *apparent* GOS determined by the experiments. Representative examples show that an simple improvement scaled by $T + B + E$ extends the usage of the Born-Bethe approximation into the *intermediate* region, thereby bridging the gap between the two regions categorized conventionally as slow and fast collisions.