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The Born series in atomic collisions — 2nd Born and higher contributions in double excitation processes

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In this talk I shall address the application of the Born series to coincidence studies of double excitation processes. Specifically, I shall look at (e,2e) excitation - ionization, (e,2e) excitation - autoionization and (e,3e) double ionization of ground state helium under electron impact. Without correlation the first Born amplitude is zero. Consequently, the second Born and higher terms are much more important than for single excitation processes. Correlation gives a non-zero first Born term which depends sensitively on the quality of the helium ground state wave function and the representation of the final ionized state. This latter is particularly important in (e,3e) where the final state is doubly ionized. In the second Born term there is the possibility of a two-step mechanism involving two consecutive virtual single excitations. If the second Born term is dominated by this mechanism then it should be less sensitive to correlation in the initial and final states. The computational implementation of this theory will be discussed.