Relativistic regimes in which Compton scattering doubly differential cross sections obtained from impulse approximation are accurate due to cancelation of errors. L.A. LAJOHN, R.H. PRATT, University of Pittsburgh — There is no simple parameter that can be used to predict when impulse approximation (IA) can yield accurate Compton scattering doubly differential cross sections (DDCS) in relativistic regimes. When Z is low, a small value of the parameter $<p>/q$ (where $<p>$ is the average initial electron momentum and q is the momentum transfer) suffices. For small Z the photon electron kinematic contribution described in relativistic S-matrix (SM) theory reduces to an expression, $X^{rel}$, which is present in the relativistic impulse approximation (RIA) formula for Compton DDCS. When Z is high, the S-Matrix photon electron kinematics no longer reduces to $X^{rel}$, and this along with the error characterized by the magnitude of $<p>/q$ contribute to the RIA error $\Delta$. We demonstrate and illustrate in the form of contour plots that there are regimes of incident photon energy $\omega_i$ and scattering angle $\theta$ in which the two types of errors at least partially cancel. Our calculations show that when $\theta$ is about 65° for Uranium K-shell scattering, $\Delta$ is less than 1% over an $\omega_i$ range of 300 to 900 keV.