## The lymphoma-lipoma diagnostic challenge

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**Abstract**

Stopping power is a necessary ingredient for many parts of basic science as well as for medical and technological applications. It is described by the Bethe's stopping power formula. However, the Born approximation, upon which Bethe's formula is based, is inadequate to the task of accurately describing the energy-loss distribution (ELD) of highly charged particles. The essential contribution to the ELD higher moments is made by close collisions. Therefore, significant deviations in calculations of these quantities in Mott's approximation from the Born one can be expected. In this work, we obtained analytical and numerical results for the most common ELD characteristics in the Mott and Born approximations, which allowed us to show that when the absolute values of the relative Mott corrections (MCs) to the normalized central moments of ELD calculated in the Born approximation do not exceed 50% for the heavy ions of moderately relativistic energies, the relative Mott corrections $\delta_n$ (n = 2,3,4) to the Born central moments $\rho_{n,B}$ (n = 2,3,4) can reach ~200% over the range $5 < Z < 95$ of the particle charge number at the relative ion velocity $\beta = 0.75$ (Figure 1). The results are based on the proposed representation of the Mott corrections to the Bethe-Bloch formula in the form of rapidly convergent series of quantities bilinear in the Mott partial amplitudes, which reduces their calculation to the summation of fast converging infinite series. They mean the dominant contribution of close collisions to the ELD higher moments.

**Image**

