(Atomic electrons)

# Effect of Delta Rays on the EDM Experiment

**William Morse - BNL**

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In this note I calculate the number of delta rays produced at a vacuum level of $5 \times 10^{-4}$ Torr Helium by $10^{11}$ Deuterons. This is a typical pressure for electro-static separators which give increased HV stability. Ref. 1 gives for the number of primary ionizations:

$$\frac{e}{Km} = \frac{5\times10^{5}}{Km} \times \frac{5\times10^{-4} Torr}{760 Torr} = 0.33 \frac{e}{Km}$$

This does not include the secondary ionizations from collisions $He^{*} + He \rightarrow He + He^{+} + e^{-}$, which are not important at our low vacuum pressures. Subtracting out the ionization energy, gives an average delta ray kinetic energy of $\approx 10^{2}$ eV.

With $10^{11}$ deuterons, this produces $\approx 3 \times 10^{10}$ e/Km. The important question is what happens to these electrons. This depends on the detailed design of the electrodes. Note that with the E821 vacuum of $5 \times 10^{-7}$ Torr, we still get $\approx 3 \times 10^{7}$ e/Km.

## References

1. Review of Particle Physics.