Beam Time Estimation for the Carbon Run

Areal density of the 1 μm ^{12}C film

- Density of Carbon:

$\rho(^{12}C) = 2.25\ g/cm^3$

- Areal density for the 1 μm ^{12}C film:

$N(^{12}C\ per\ cm^2) = (\rho\ t)N_A / A_{12c} = (2.25 \times 1.10^{-4})\ 6.02\ 10^{23} / 12 = 1.125 \times 10^{19}\ atom/cm^2$

Event Yield for $e + {}^{12}C \rightarrow e + {}^{12}C$

- $N(e + {}^{12}C \rightarrow e + {}^{12}C) = (Z^2_C / Z^2_P)\,(N_{12C} / N_p)\,N(ep \rightarrow e\,p)$

  $= 36 \times 7 \times N(ep \rightarrow e\,p)$

  $\cong 252 \times N(ep \rightarrow e\,p)$

- Run Conditions:

  a) beam current: $I = 1$ nA

  pre-scaled factor $2^4 = 16$

  b) beam current: $I = 2$ nA

  pre-scaled factor $2^5 = 32$

Event Yield for Moeller $e + e \rightarrow e + e$

- $N(e + {}^{12}C \rightarrow e + {}^{12}C) = (Z_C / Z^2_P)\,(N_{12C} / N_p)\,N(ee \rightarrow e\,e)$

  $= 6 \times 7 \times N(ee \rightarrow e\,e)$

  $\cong 42 \times N(ee \rightarrow e\,e)$

- Run Conditions ARE THE SAME as for the Mott:

  a) beam current: $I = 1$ nA
     pre-scaled factor $2^4 = 16$

  b) beam current: $I = 2$ nA
     pre-scaled factor $2^5 = 32$