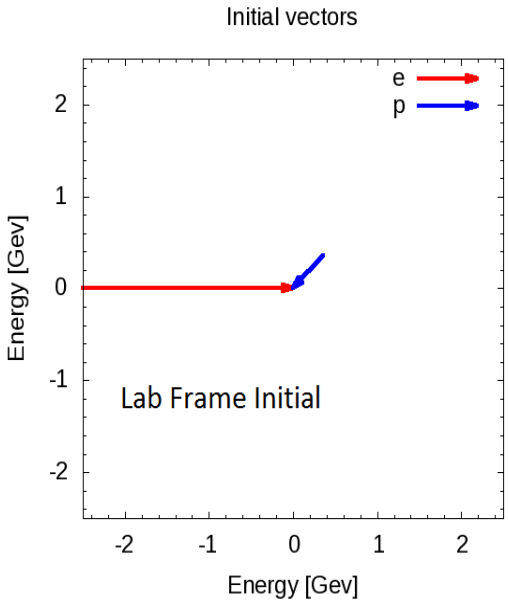
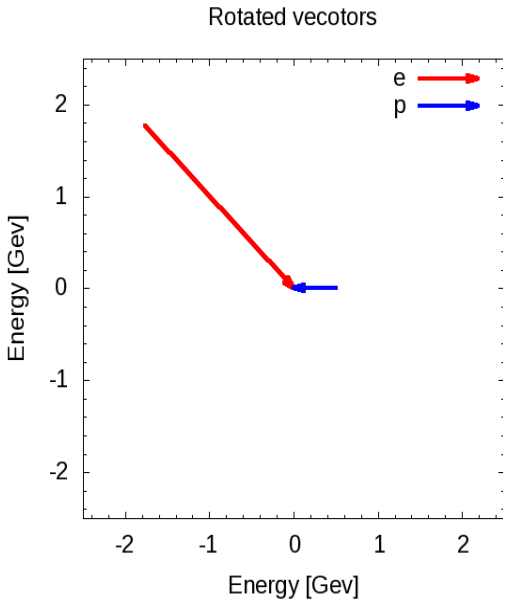
Current Work

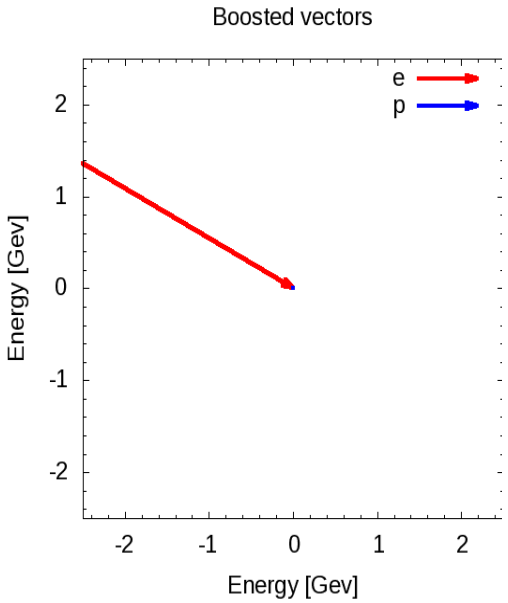
Convolution Program

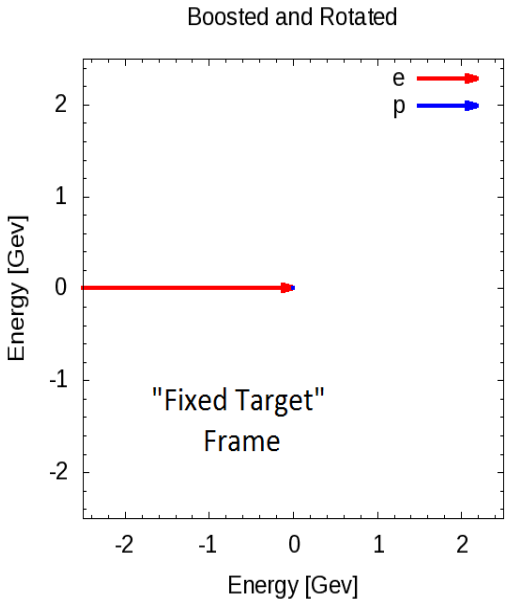
- Investigate the EMC, SRC, and the correlations between the two:
  - Developing a Simulation
    - Systematic
    - Monte Carlo
    - Momentum Dependence
  - Scatter an electron off of a moving proton
  - Change initial direction of the proton
  - Change the direction of the Scattered electron

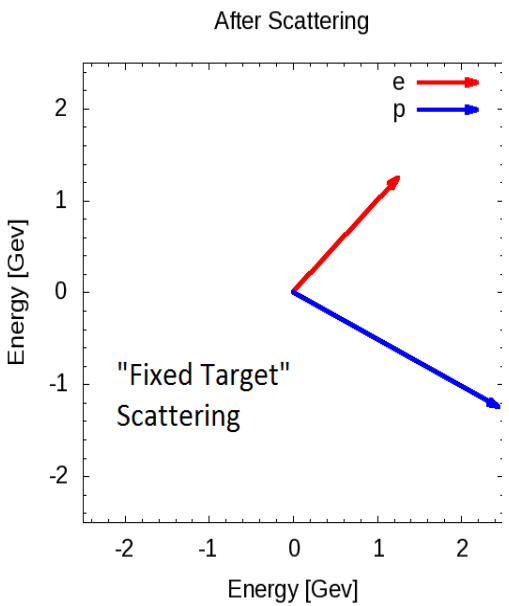
Transformations

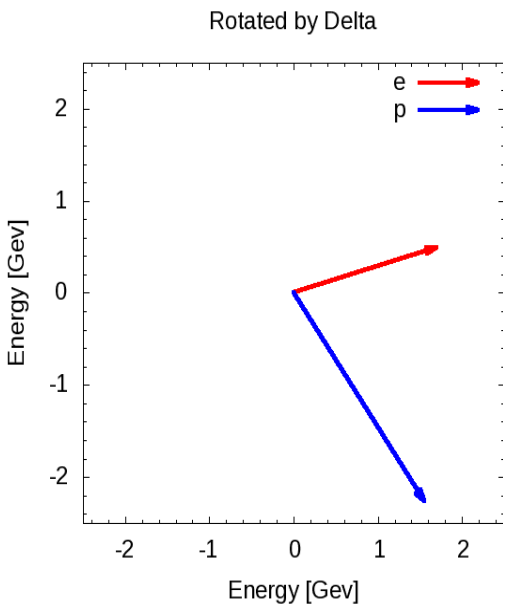


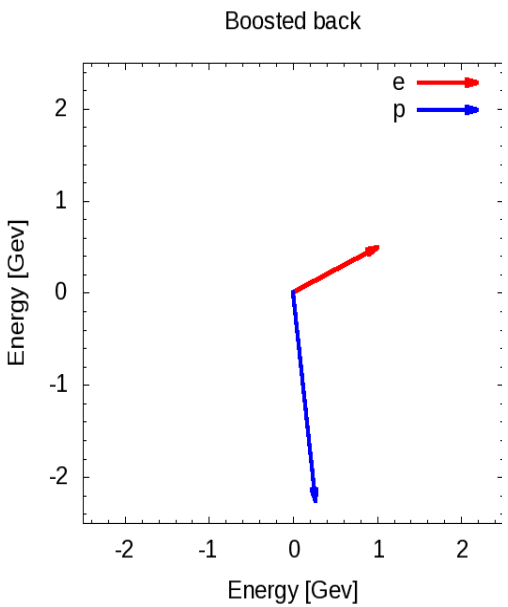


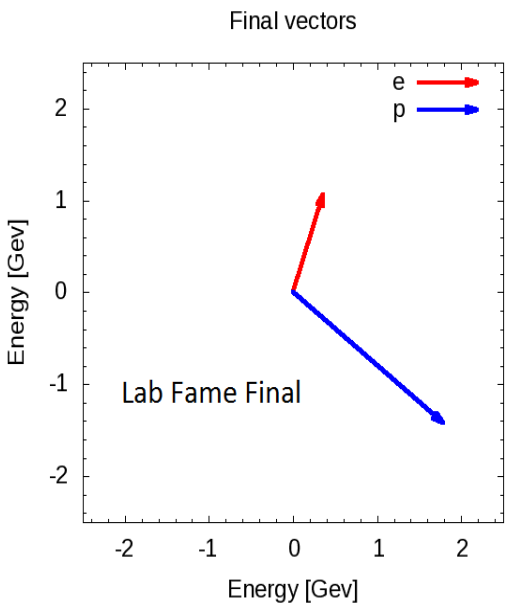












Inelastic scattering

I calculated F_2 using the parameterization found in a paper by L.W. Whitlow

$$F_2^{\text{fit}}(x, Q^2) = \beta F_2^{\text{thr}}(x) \times \left[1 + \lambda_1(x) \log\left(\frac{Q^2}{A(x)}\right) + \lambda_2(x) \log^2\left(\frac{Q^2}{A(x)}\right) \right],$$

$$F_2^{\text{thr}}(x) = \sum_{i=1}^{5} C_i (1-x)^{i+2},$$

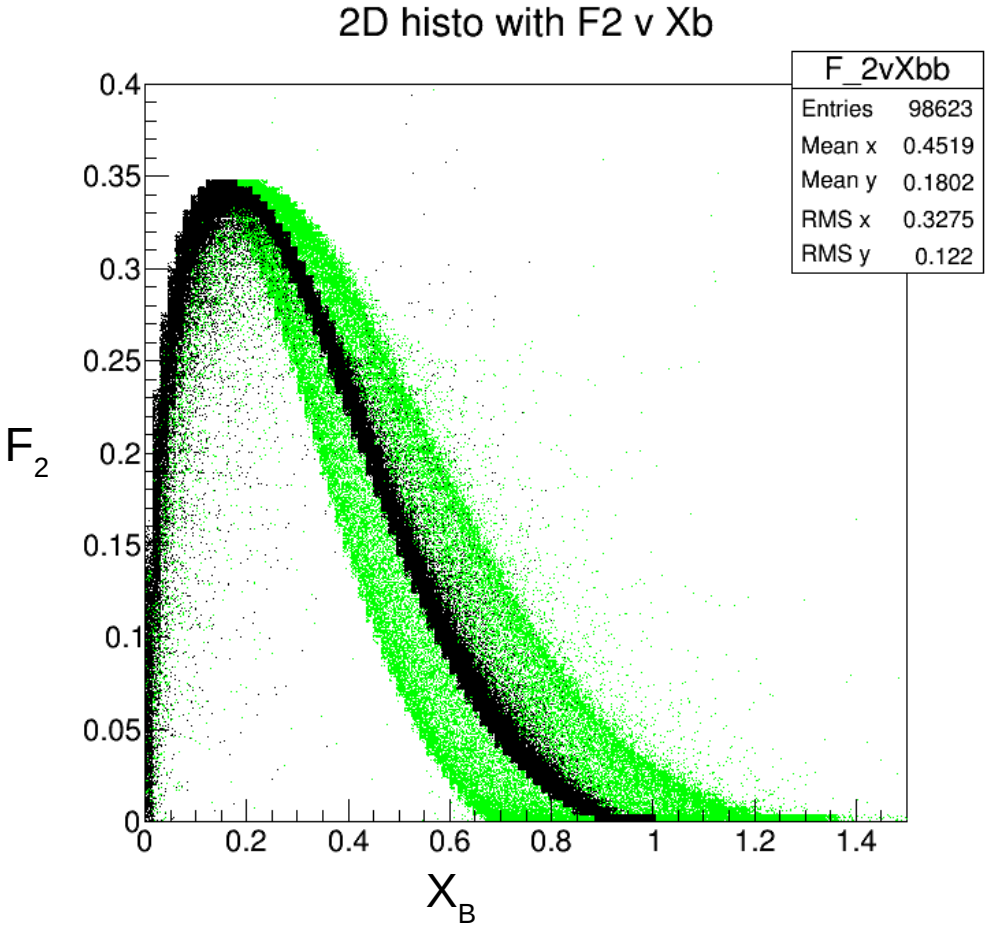
$$\lambda_1(x) = \sum_{i=0}^{3} C_{i+9} x^i,$$

$$\lambda_2(x) = C_6 + C_7 x + C_8 x^2, \quad \text{if } Q^2 \leqslant A(x),$$

Coefficient	Hydrogen	Deuterium
C_1	1.417 ± 0.039	0.948 ± 0.027
C_2	-0.108 ± 0.311	-0.115 ± 0.215
C_3	1.486 ± 0.903	1.861 ± 0.624
C_4	-5.979 ± 1.106	-4.733 ± 0.762
C_5	3.524 ± 0.482	2.348 ± 0.333
C_6	-0.011 ± 0.025	-0.065 ± 0.024
C_7	-0.619 ± 0.153	-0.224 ± 0.144
C_8	1.385 ± 0.213	1.085 ± 0.193
C_9	0.270 ± 0.028	0.213 ± 0.024
C_{10}	-2.179 ± 0.221	-1.687 ± 0.183
C_{11}	4.722 ± 0.537	3.409 ± 0.439
C_{12}	-4.363 ± 0.405	-3.255 ± 0.333

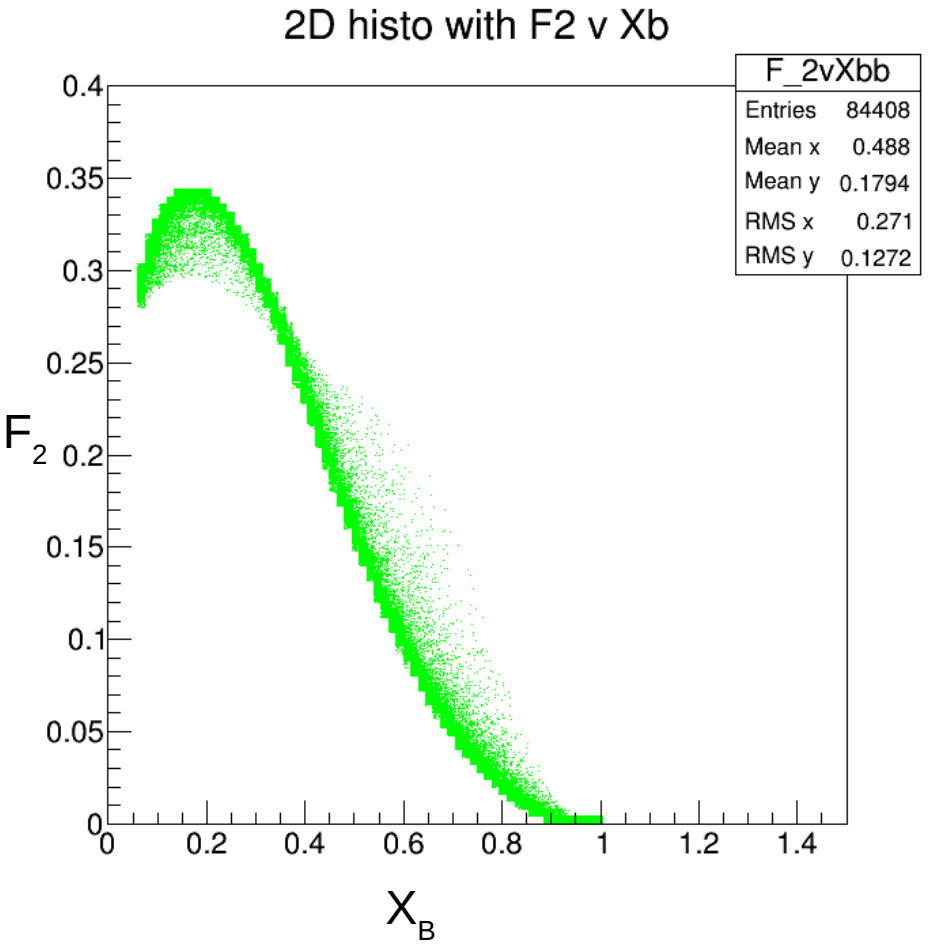
Proton momentum = 0.25 GeV
F_2 v X_B

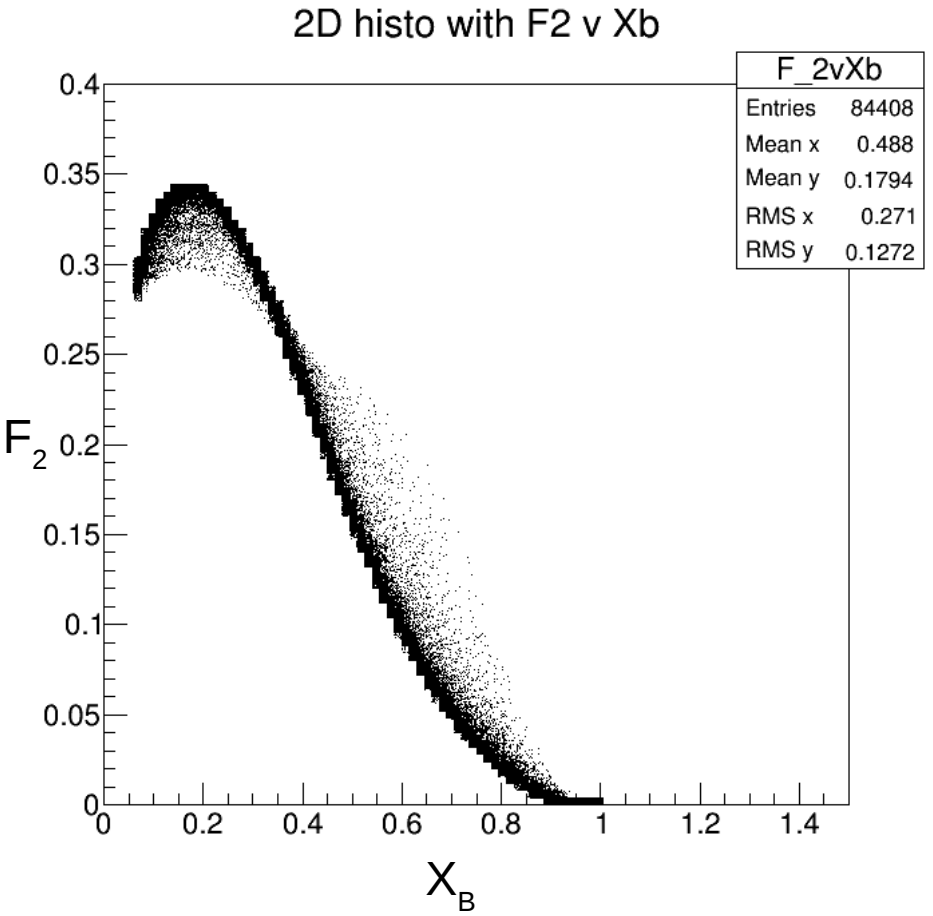
Green → Lab Frame Black → Rest frame



Proton momentum = 0.0 GeV
F_2 v X_B

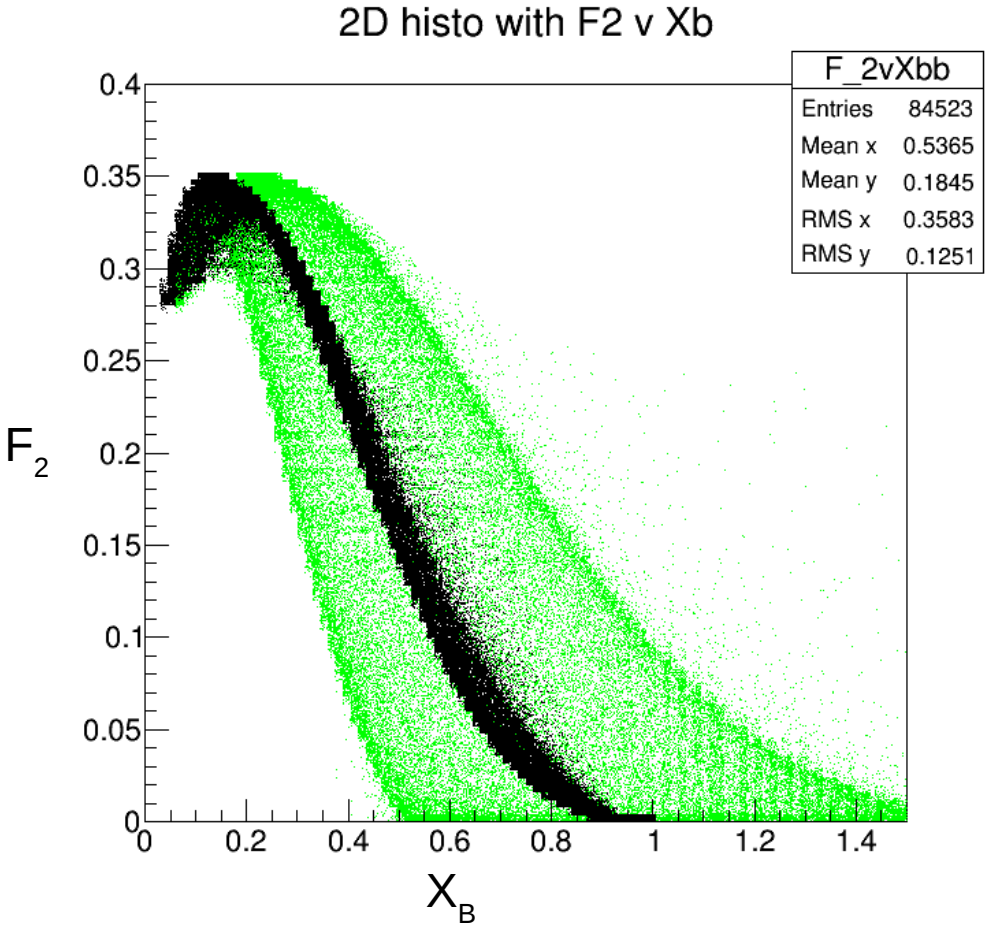
Green → Lab Frame Black → Rest frame





Proton momentum = 0.5 GeV
F_2 v X_B

Green → Lab Frame Black → Rest frame



- Cross section from a paper from Petratos.

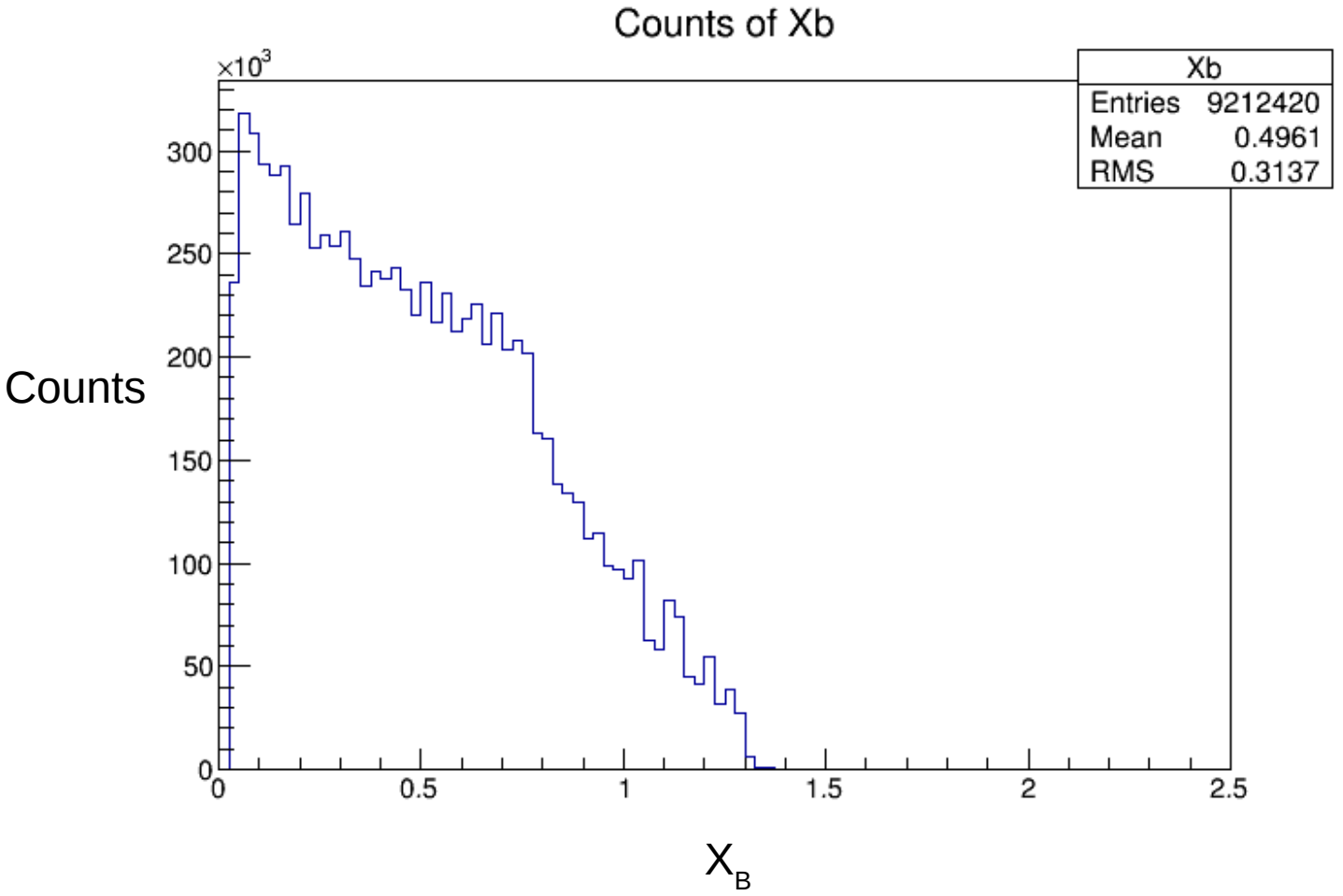
$$\sigma \equiv \frac{d^2\sigma}{d\Omega dE'}(E, E', \theta) = \frac{4\alpha^2(E')^2}{Q^4}\cos^2\left(\frac{\theta}{2}\right)\left[\frac{F_2(\nu, Q^2)}{\nu} + \frac{2F_1(\nu, Q^2)}{M}\tan^2\left(\frac{\theta}{2}\right)\right] ,$$

$$F_1 = \frac{1}{2}\sum_i e_i^2 f_i(x) , \qquad F_2 = x\sum_i e_i^2 f_i(x) .$$

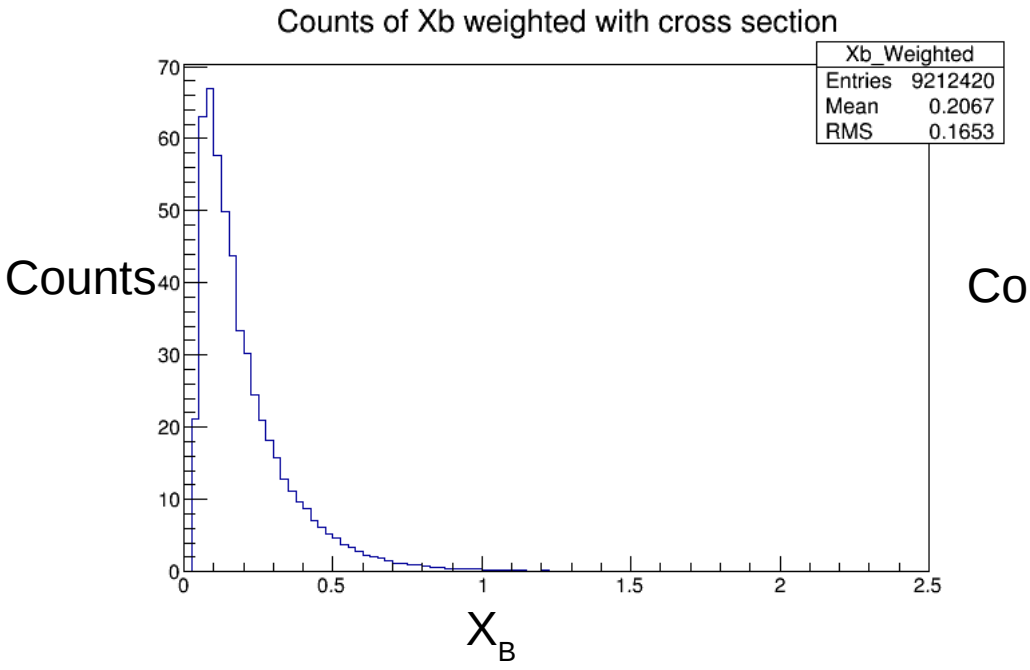
My code for calculating the cross section.

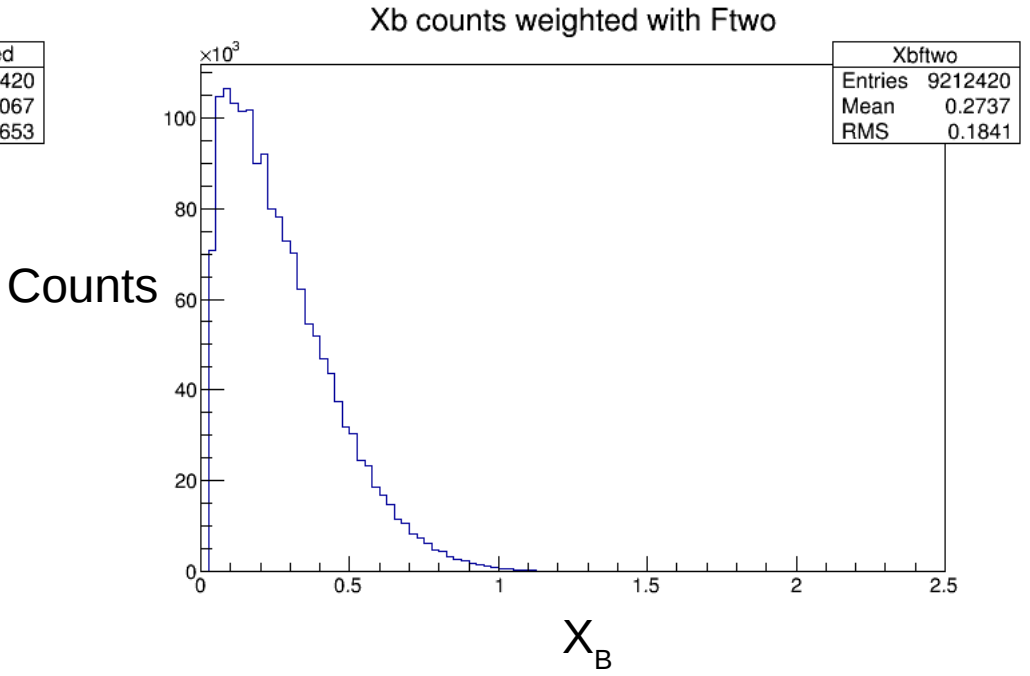
```
//Inelastic Cross Section
double alpha = (1.0/137.0);
double A = 4*alpha*alpha*e_final[0]*e_final[0]*pow(cos(theta/2.0),2)/pow(Qsquared,2);
double B = F_two/mp;
double C = 2 * (F_two/xb) *pow(tan(theta/2),2);
double diffcross = A*(B+C);
```

Counts of Xb for Beam energy of 10 GeV, Proton momentum = 0.25 GeV

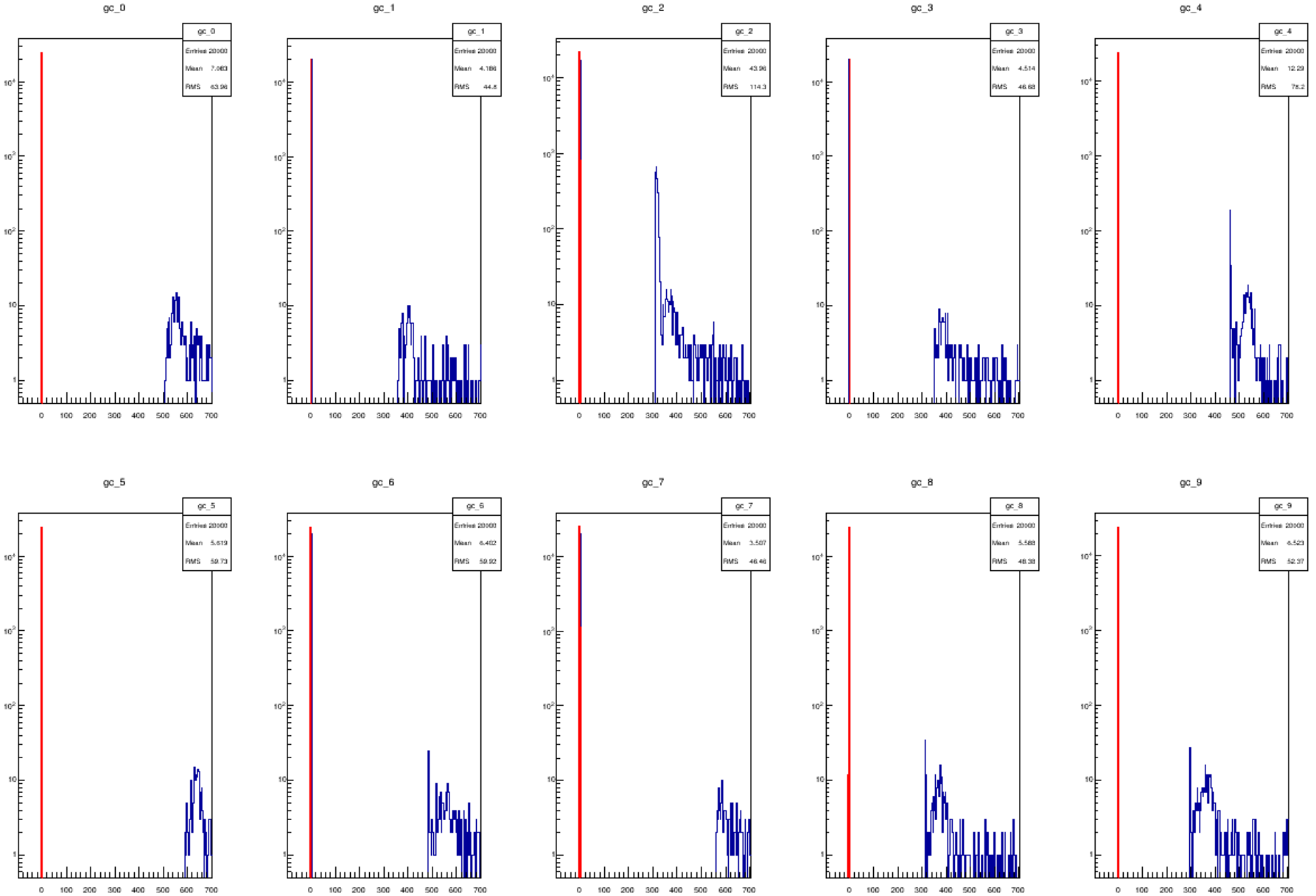


Counts of Weighted Xb for Beam energy of 10 GeV, Proton momentum = 0.25 GeV
Left: weight by cross section Right: weighted By F_2

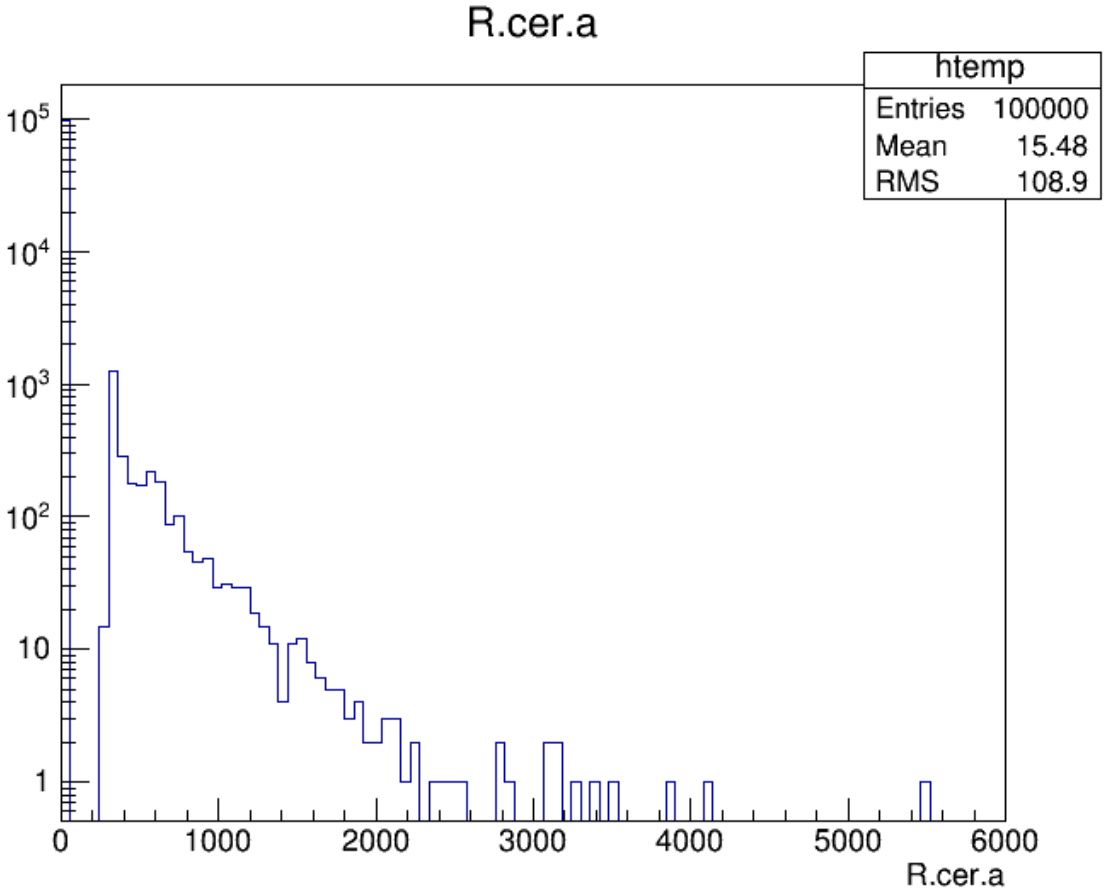




Tried to Look at some calibration scripts.

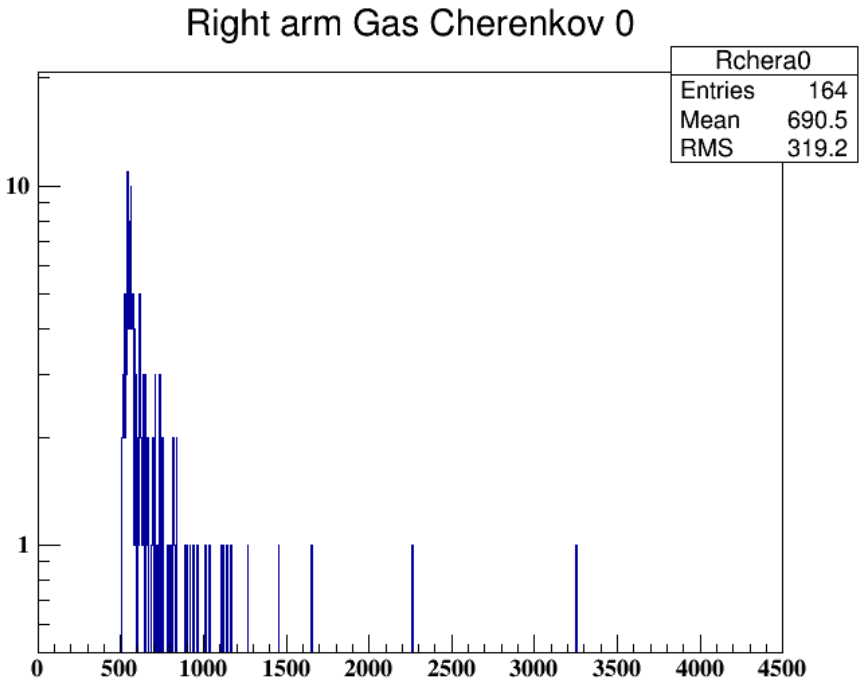


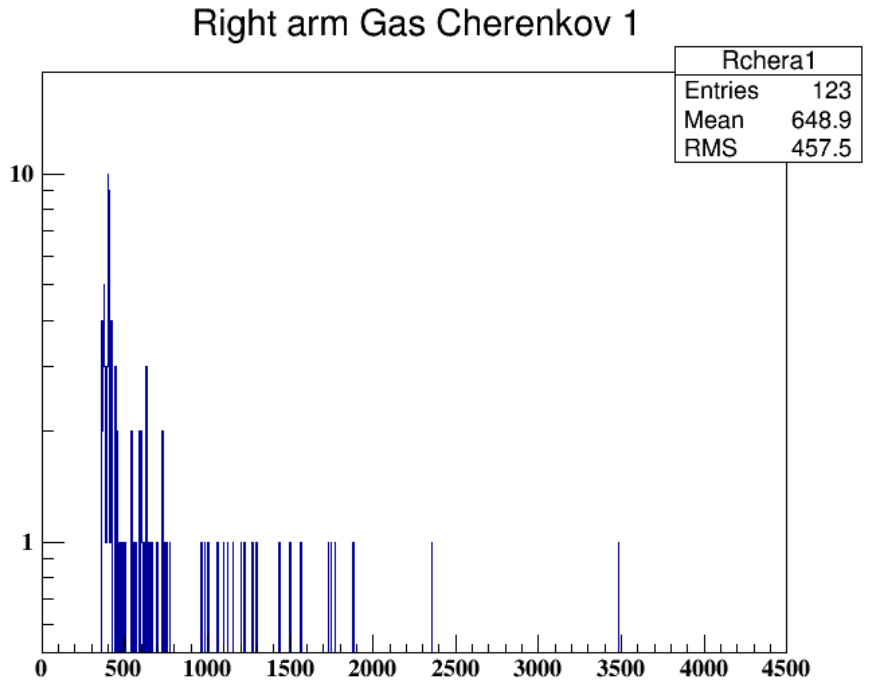
Ntuple for block R.cer.a* from analyzer.



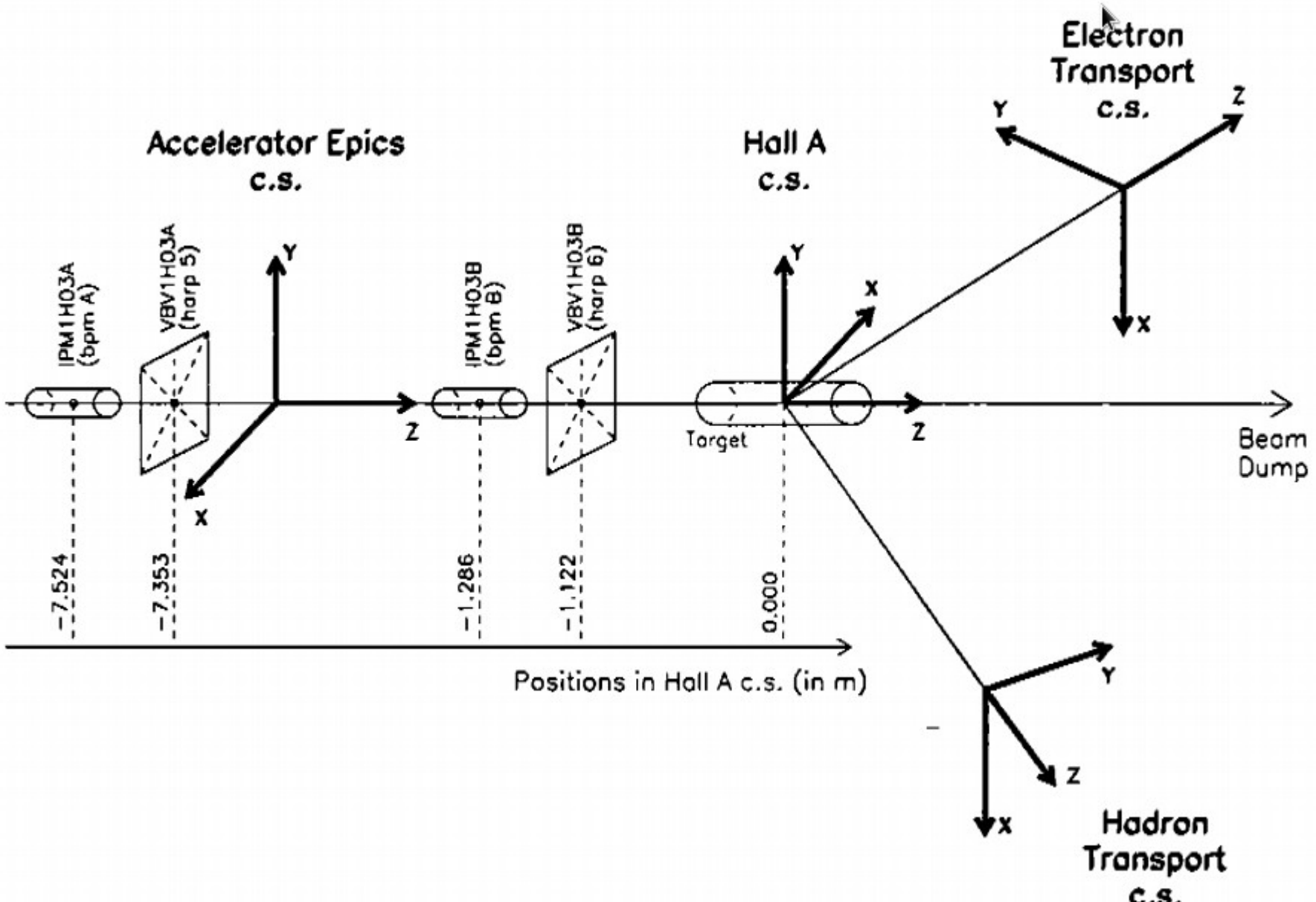
From .odef

TH1F Rchera 'Right arm Gas Cherenkov' R.cer.a 1000 0 4500 R.cer.a>0.
For 0 and 1.





Experiment expert
BPM and Harps



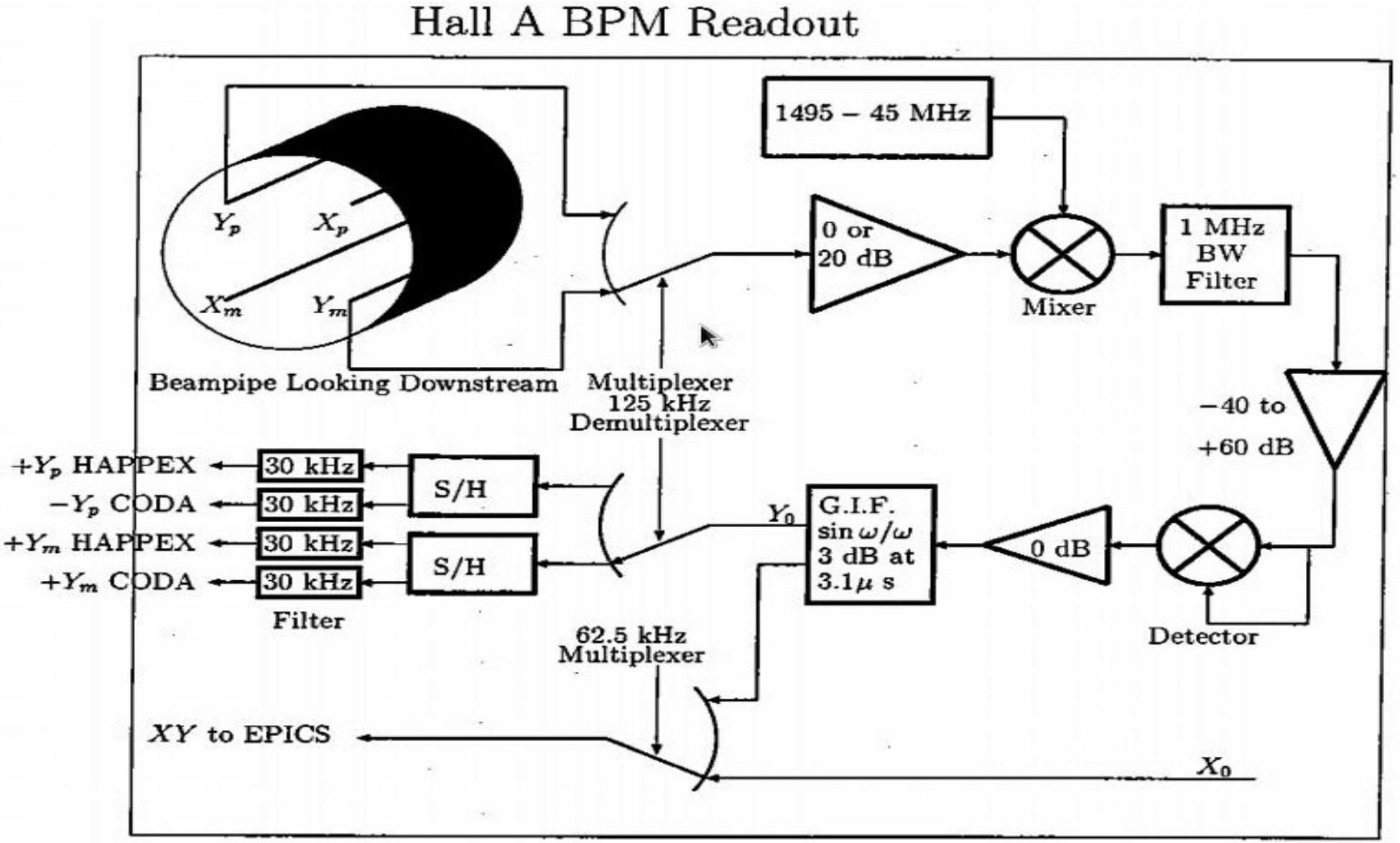


Figure 3: ***Hall A Beam Position Monitor read-out electronics for E93050, March-April 1998.***