## $\Lambda$ polarization in 800 GeV/c $pp \rightarrow p_f(\Lambda K^+)$ (E690 Preliminary)

- Large $\Lambda$ polarization observed
  - Both positive and negative polarization!
  - Polarization observed over a large range of $\Lambda$ production phase space
- Polarization is NOT a simple function of $x_F$ and $p_T$.
- Polarization DOES look "simple" (monotonic) as a function of $\Lambda K^+$ effective mass.

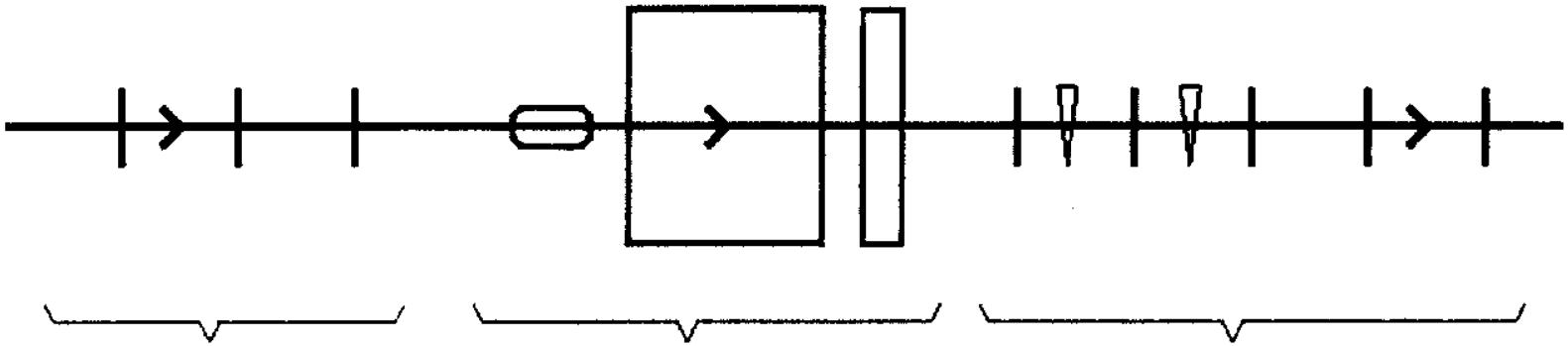
# Fermilab E690 Collaboration

J. Felix, C. Avilez, G. Moreno, M.A. Reyes, and M. Sosa
*Instituto de Fisica, Universidad de Guanajuato, 37150 Leon, Guanajuato, Mexico*

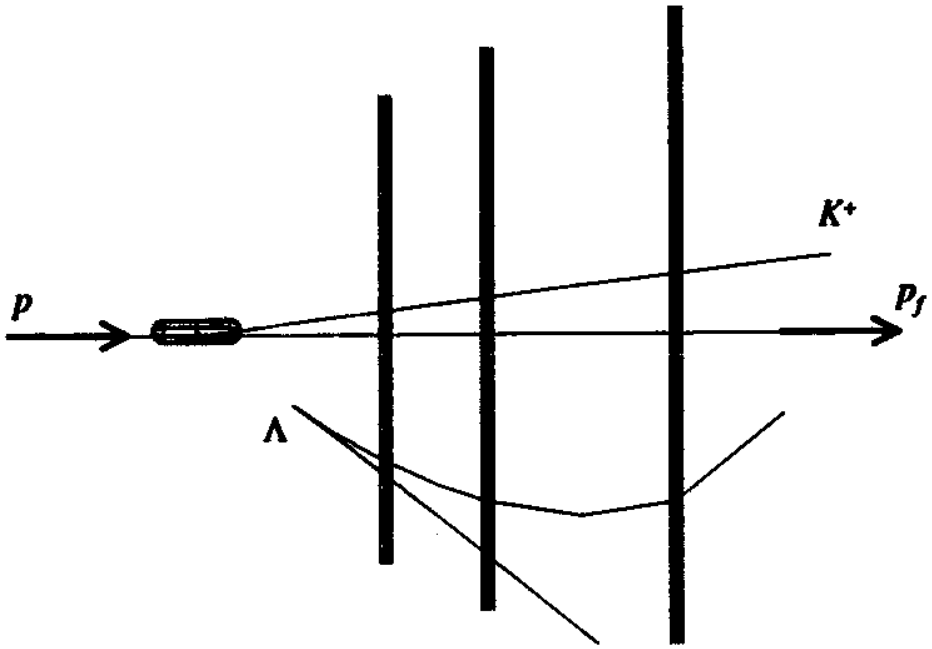
D.C. Christian, E.E. Gottschalk, G. Gutierrez, and A. Wehmann
*Fermilab, Batavia, Illinois 60510*

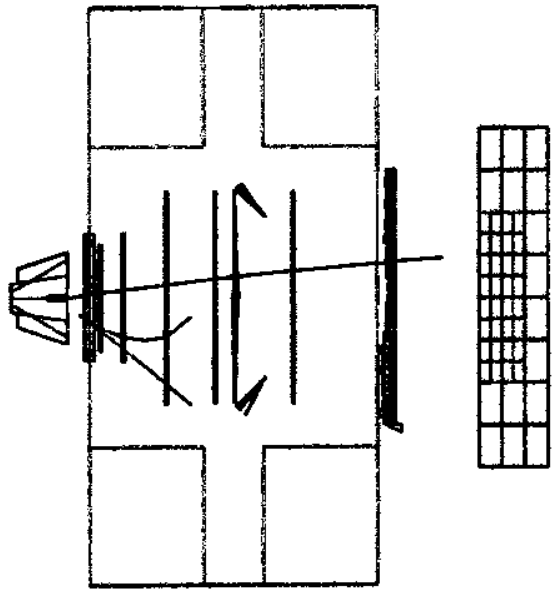
A.Gara and B.C. Knapp
*Columbia University, Nevis Laboratories, Irvington, New York 10533*

M.C. Berisso, E.P. Hartouni, M.N. Kreisler, S. Lee, K. Markianos, M.H.L.S. Wang, and D. Wesson
*Department of Physics and Astronomy, University of Massachusetts, Amherst, MA 01003*



## $pp \rightarrow p_f(X)$ ~ 5 billion events written to tape

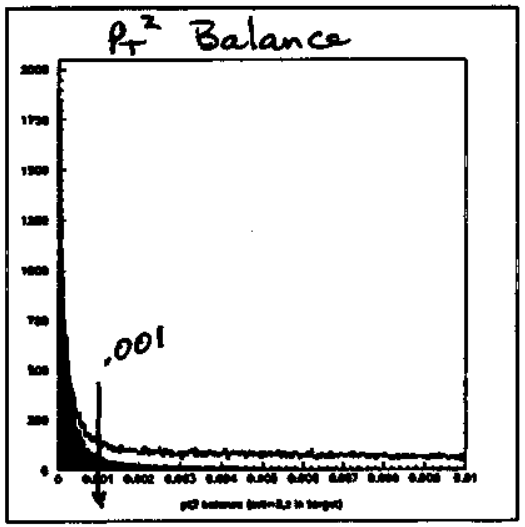


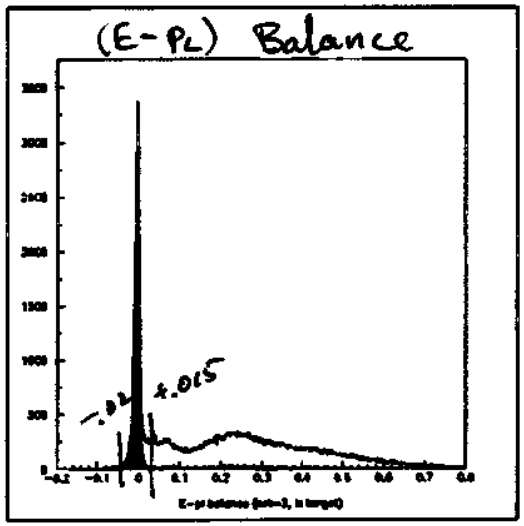



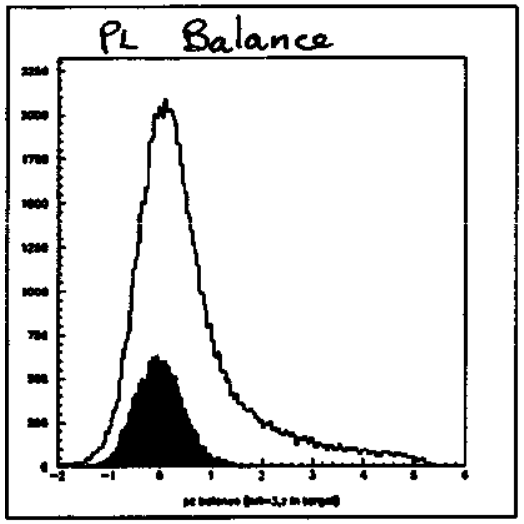
Č, TOF NOT NEEDED FOR THIS ANALYSIS

# Selection of the final state $p_f(\Lambda K^+)$ using p,E balance

## Using ~1/2 of the E690 data

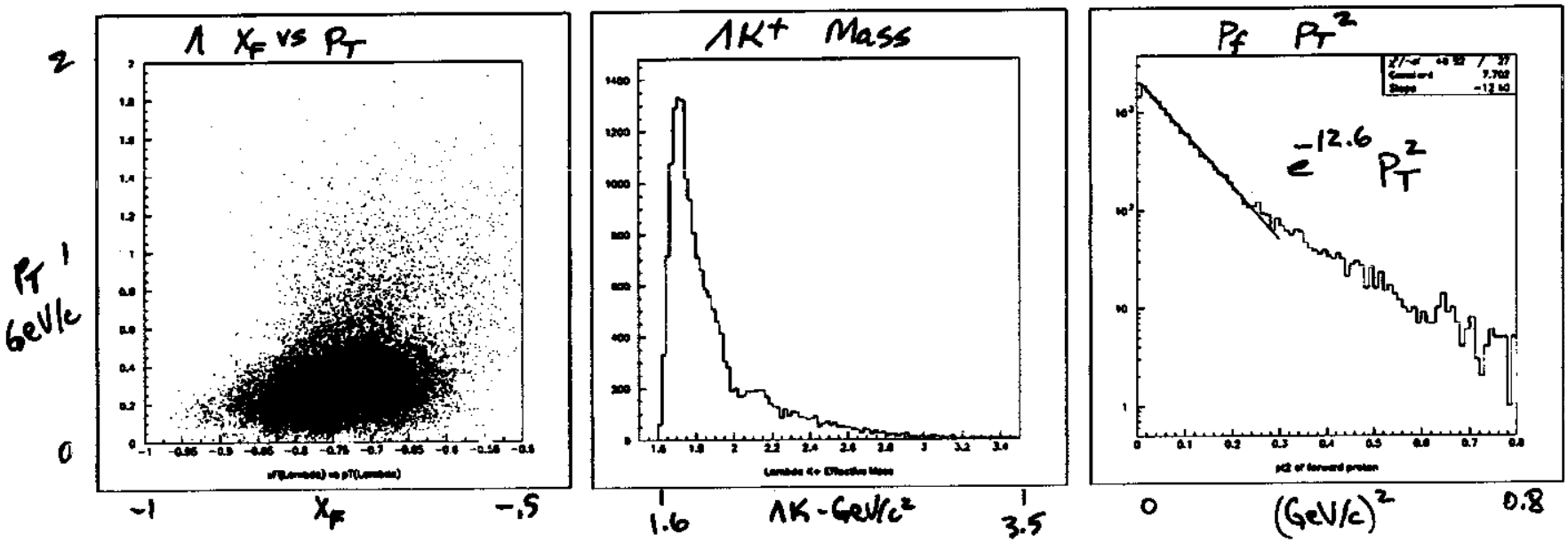


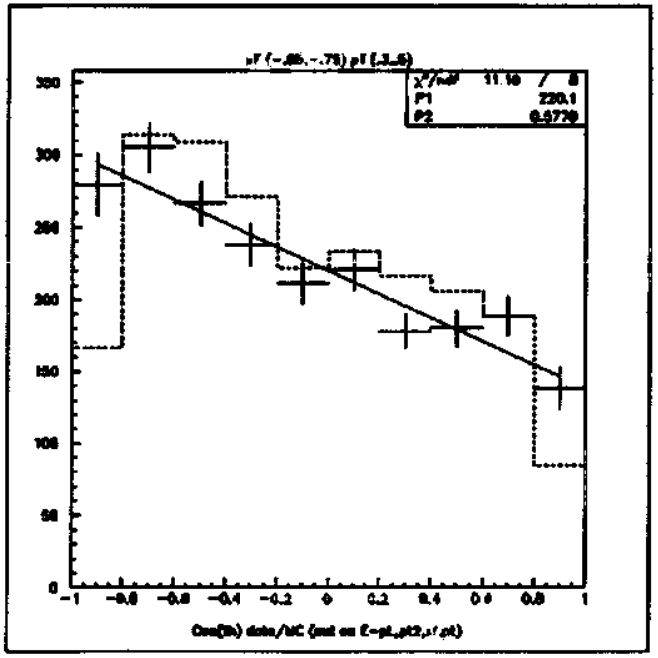



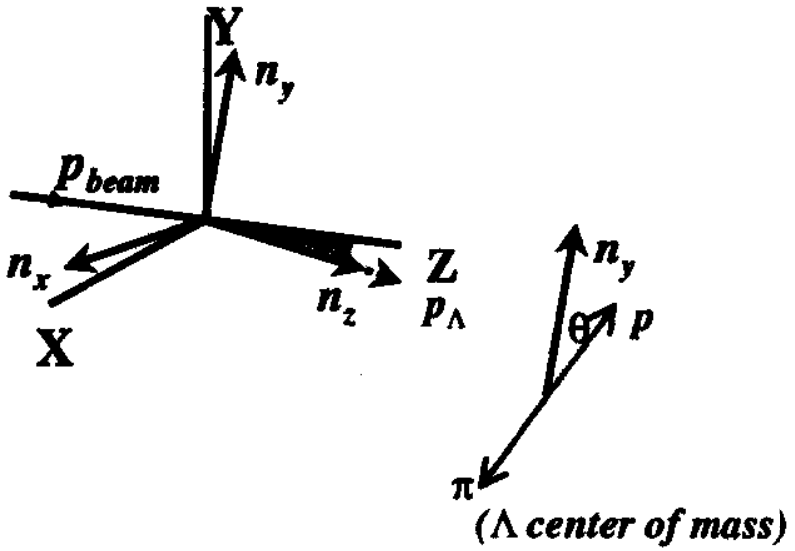

87,233 events with 3 recoil tracks, primary vertex in the $LH_2$ target
22,323 events with nrt=3, z in $LH_2$, $-0.020 < \Delta(E\text{-}pL) < 0.015$ (GeV)
22,065 events with nrt=3, z in $LH_2$, $\Delta(p_T^2)<0.001$ $(GeV/c)^2$
17,683 events with nrt=3, z in $LH_2$, $\Delta(p_T^2)<0.001$ $(GeV/c)^2$ , $-0.020 < \Delta(E\text{-}pL) < 0.015$ (GeV)

# Observed kinematic distributions



# An example: $x_F$ (-.8,-.75]; $p_T$ (0.3,0.5] GeV/c






$$\frac{dN}{d\cos\theta} = N_0\left(1 + \alpha P \cos\theta\right)$$

# $\Lambda$ polarization in bins of $\Lambda$ $x_F$ and $p_T$

| | $x_F$ (-.95,-.85] | $x_F$ (-.85,-.75] | $x_F$ (-.75,-.65] | $x_F$ (-.65,-.55] |
|---|---|---|---|---|
| $P_T$ (0.,0.1] | | 24% ± 13% | -17% ± 18% | |
| $P_T$ (0.1,0.3] | 7% ± 13% | 35% ± 4% | 38% ± 5% | 23% ± 14% |
| $P_T$ (0.3,0.5] | 18% ± 37% | 58% ± 6% | 27% ± 5% | 2% ± 12% |
| $P_T$ (0.5,0.8] | | 67% ± 14% | 21% ± 9% | -8% ± 15% |
| $P_T > 0.8$ | | -35% ± 25% | -49% ± 13% | -53% ± 17% |

# Λ polarization in bins of $\Lambda K^+$ effective mass

| $\Lambda K^+$ Effective Mass Range | (1.5,1.7] GeV/$c^2$ | (1.7,1.8] GeV/$c^2$ | (1.8,1.95] GeV/$c^2$ | (1.95,2.2] GeV/$c^2$ | (2.2,2.5] GeV/$c^2$ | (2.5,2.8] GeV/$c^2$ | (2.8,5.0] GeV/$c^2$ |
|---|---|---|---|---|---|---|---|
| Λ Polarization | 63%±5% | 30%±4% | 24%±5% | 20%±6% | 2%±7% | -37%±11% | -67%±13% |