Spin Structure Functions in the Resonance Region at Jefferson Lab Hall C

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- Physics
- Details of Experiment
- Accomplishments

E01-006 Key Information

"RSS" - Resonances in Spin Structure

Collaboration

Basel University, Florida International University, Hampton University, Jefferson Laboratory, Mississippi State University, North Carolina A&T State University, Norfolk State University, Old Dominion University, Southern University at New Orleans, Tel Aviv University, University of Massachusetts, University of Maryland at College Park, University of North Carolina at Wilmington, University of Virginia, Virginia Polytechnic Institute & State University, Yerevan Physics Institute

Location

Jefferson Laboratory, Hall C

Time

21 January 2002 - 3 March 2002

Background

- Structure Functions are well explored in the Deep Inelastic Region ($Q^2 > 1$,$W > 2$)

- JLab allows access to Resonance Region ($W < 2$) where there is much less data (none for transverse)

- **Strategy**: Measure inclusive scattering of a longitudinally polarized beam from both a longitudinally and transversely polarized solid target

- **Measure**: $A_{\parallel}$ and $A_{\perp}$ to obtain $A_1(\nu, Q^2)$ and $A_2(\nu, Q^2)$ of proton and deuteron

- **Kinematics**: $Q^2 \sim 1.3$ GeV^2, $0.6 < W < 1.5$ GeV

- **Study**: W-dependence, onset of polarized local duality, twist-3 effects

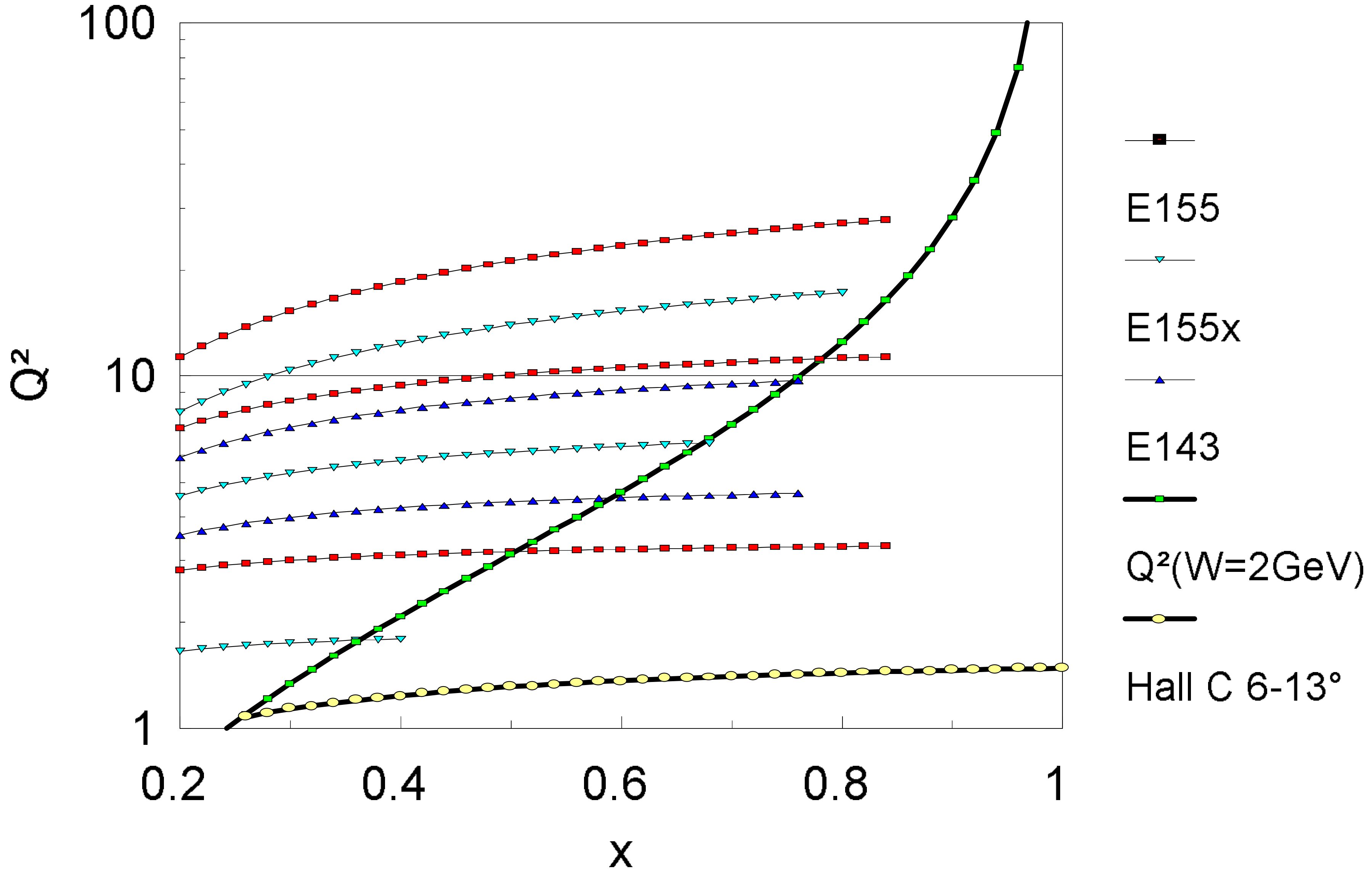
Experimental Plan

Beam	E_0 = 5.759 GeV I = 100-150 nA $<P_b>$ = 70%
HMS	$1.48 < W < 1.95$, 4.095 GeV/c $0.83 < W < 1.59$, 4.723 GeV/c
Target	Proton ($^{15}NH_3$): $<P_t>$=80% Deuteron ($^{15}ND_3$): $<P_t>$=22%

Hours	$A_{\parallel}^{p}$	$A_{\parallel}^{d}$	$A_{\perp}^{p}$	$A_{\perp}^{d}$
Planned	52h	70h	76h	78h
Actual	More than 90%			

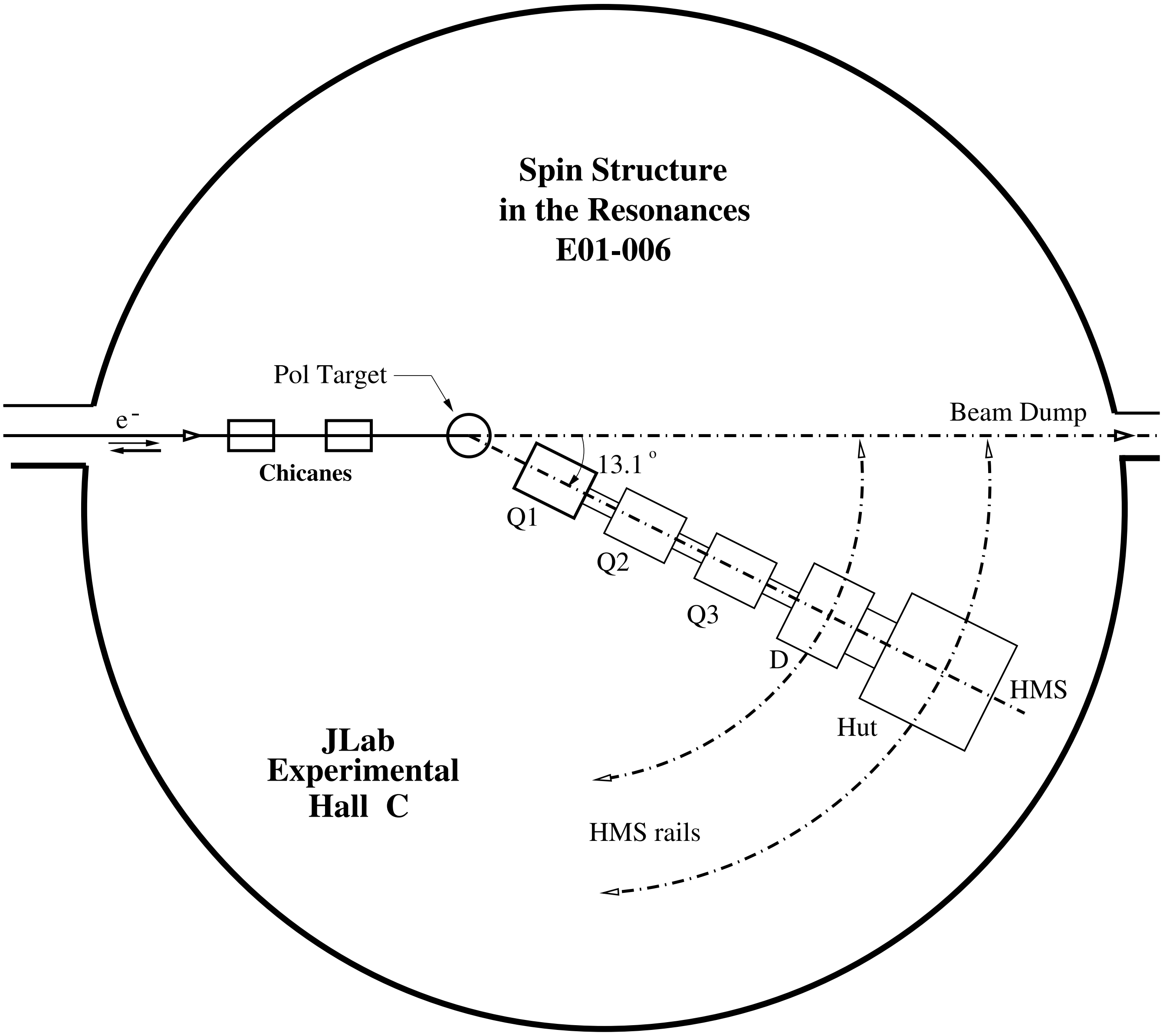
Proton Triggers: 160 million

Deuteron Triggers: 350 million

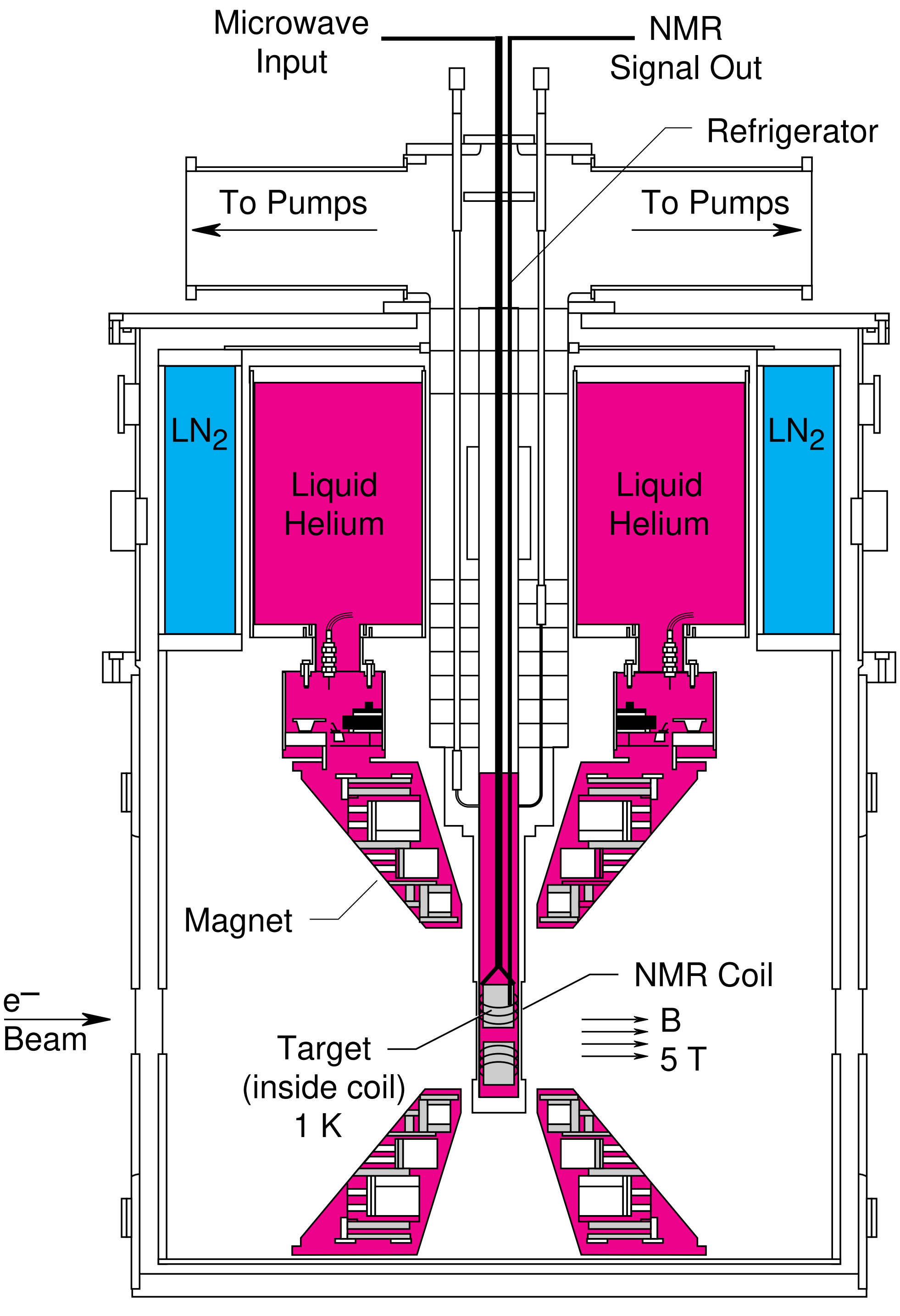


100
10
1
Q²
0.2
0.4
0.6
0.8
1
x
E155
E155x
E143
Q²(W=2GeV)
Hall C 6-13°

Experiment Layout



Schematic of Target Cryostat



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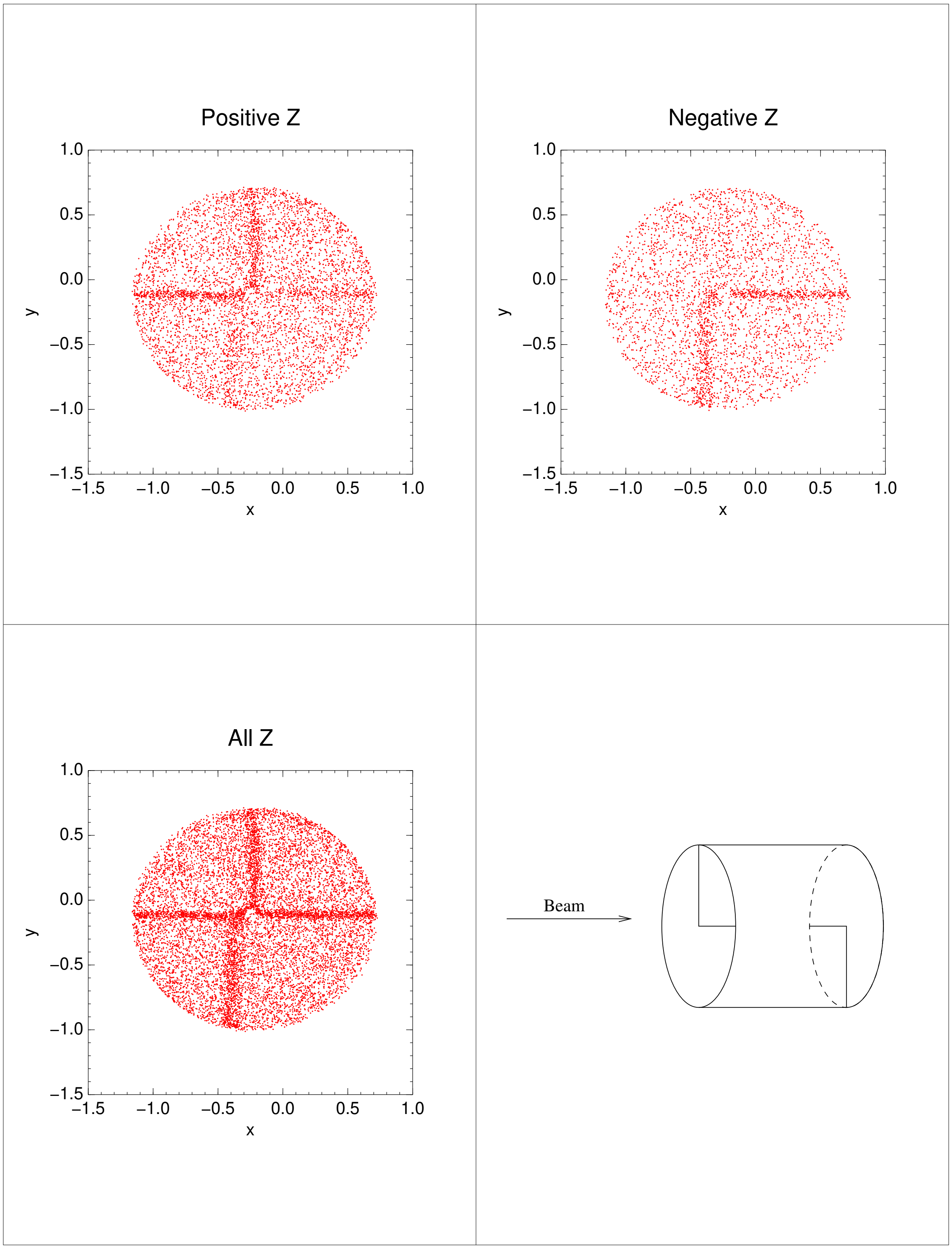
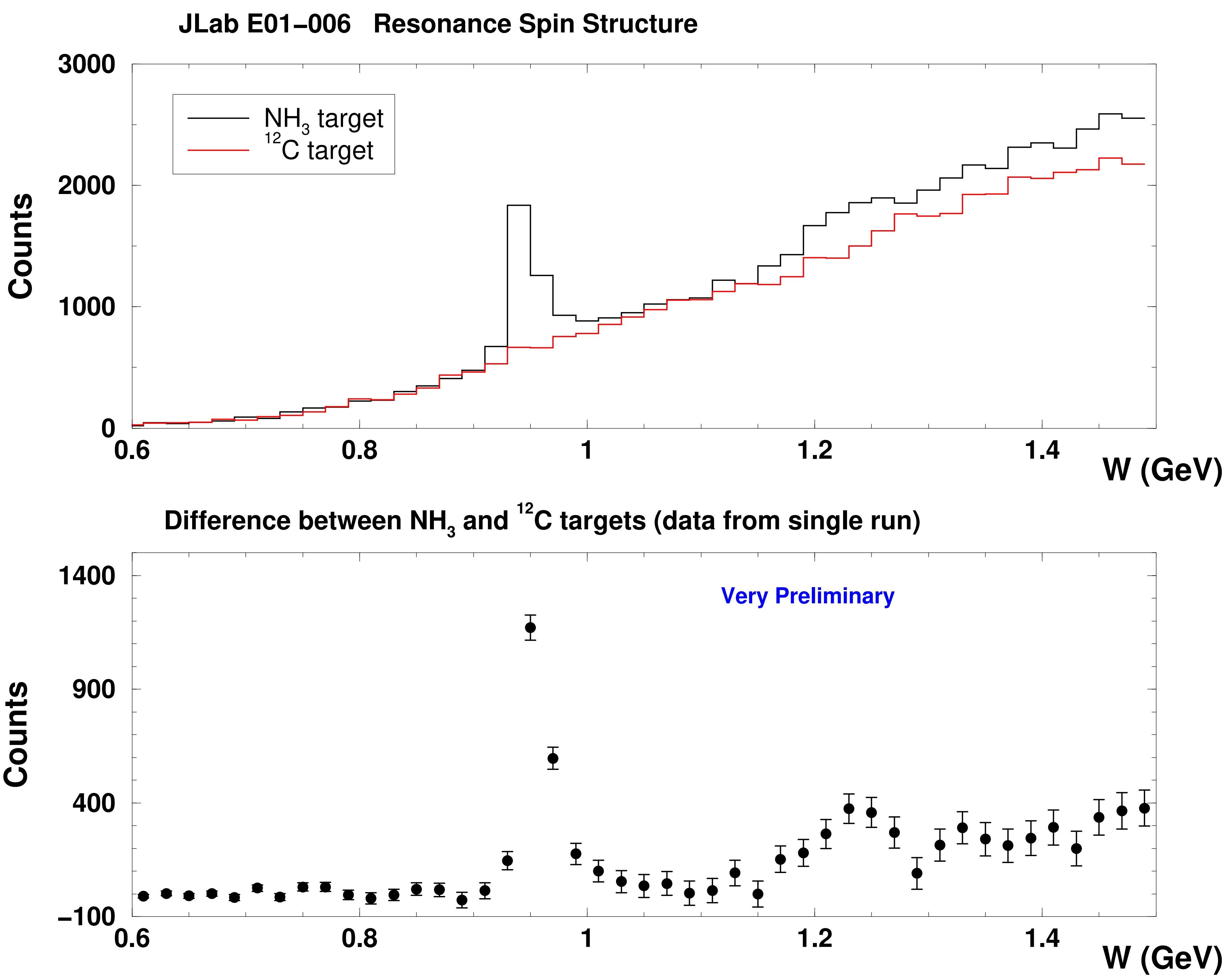
Crosshair Alignment Target





JLab E01−006 Resonance Spin Structure
Counts
3000
2000
1000
0
0.6
0.8
1
1.2
1.4
W (GeV)
NH3 target
12C target
Difference between NH3 and 12C targets (data from single run)
Very Preliminary
Counts
1400
900
400
−100
0.6
0.8
1
1.2
1.4
W (GeV)