

# Dijets and Azimuthal Correlations

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Physics Plenary February 23, 2006

## Outline

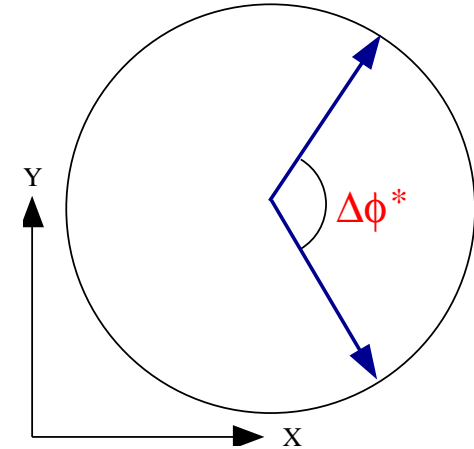
- Motivation
- Selection and Control Plots
- $\frac{d\sigma}{dQ^2 d\Delta\phi^*}$ : P, S, C, Systematic Uncertainties
- $\frac{d\sigma}{dx_{B_j} d\Delta\phi^*}$ : P, S, C, Systematic Uncertainties
- Summary

# Motivation

- Azimuthal correlations:  $\frac{d\sigma}{dQ^2 d\Delta\phi^*}$ ,  $\frac{d\sigma}{dx_{Bj} d\Delta\phi^*}$

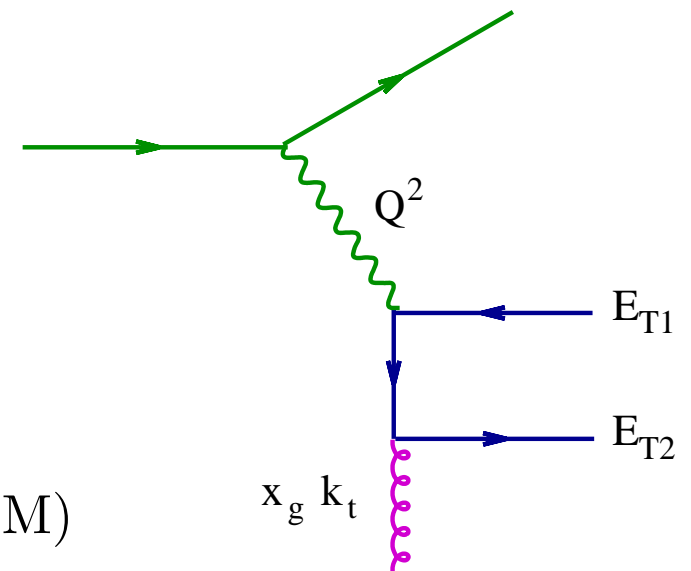
$$k_t^{*2} = E_{T1}^{*2} + E_{T2}^{*2} + 2|E_{T1}^*||E_{T2}^*|\cos\Delta\phi^*$$

Sensitive to unintegrated gluon density.

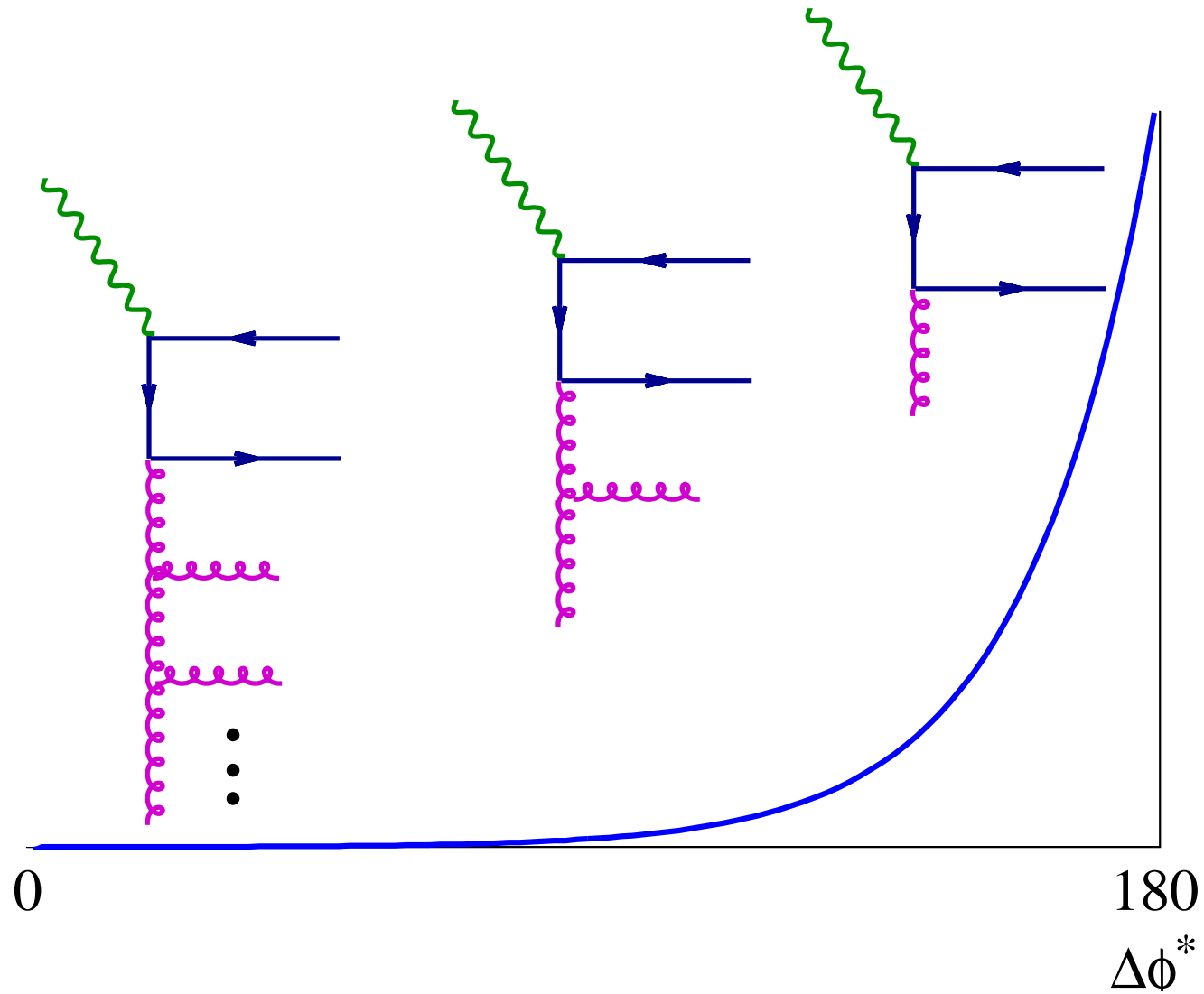


- DGLAP: Back-to-back jets in LO  
 $\Rightarrow \Delta\phi^* < 180^\circ$  from higher order QCD

- Small x: non-ordering in  $k_t$   
 $\Rightarrow \Delta\phi^* < 180^\circ$  already in LO (e.g. BFKL, CCFM)



# Motivation



# Selection and Control Plots

Using 1999/2000  $e^+$ , excluding shifted vertex runs.

	DIS Cuts		Dijet Cuts
5 GeV <sup>2</sup> <	$Q^2$	< 100 GeV <sup>2</sup>	-1 < $\eta_j$ < 2.5
0.1 <	$y$	< 0.7	5 GeV < $E_{\perp j1,2}^*$
9 GeV <	$E_e$		Sort in $\eta$ : $\eta_1 < \eta_2$
156° <	$\theta_e$	< 175°	
35 GeV <	$E - p_z$	< 70 GeV	
	$ z_{vtx} $	< 35 cm	
	$R_{clus}$	< 4 cm	
	$E_{had}$	< 0.5 GeV	
	$E_{veto}$	< 1.0 GeV	
	Trigger	S0 OR S61	

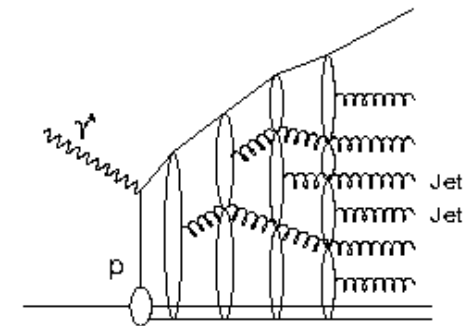
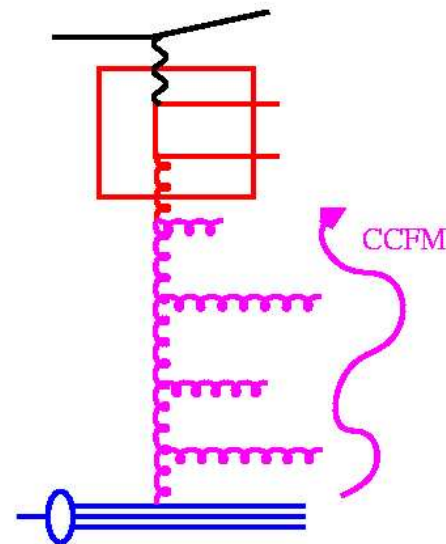
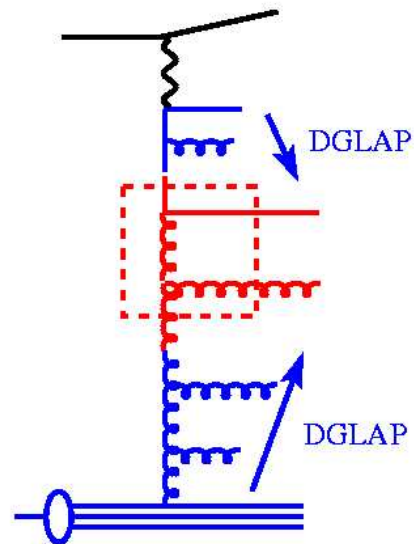
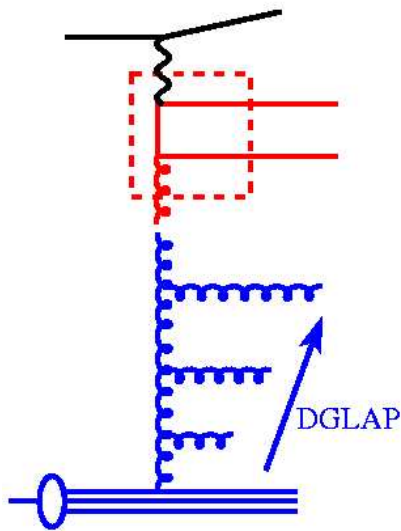
# Selection and Control Plots

Rapgap (Dir)

Rapgap (Dir + Res)

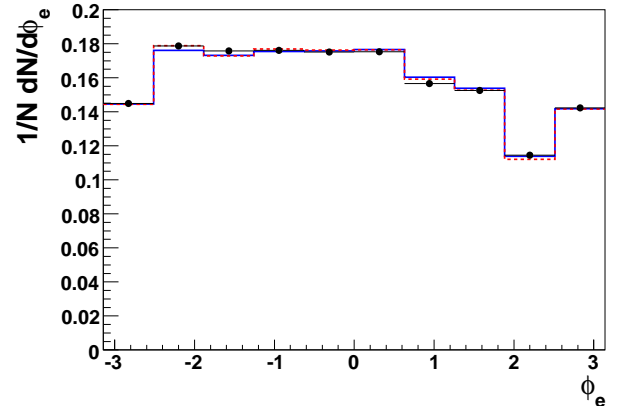
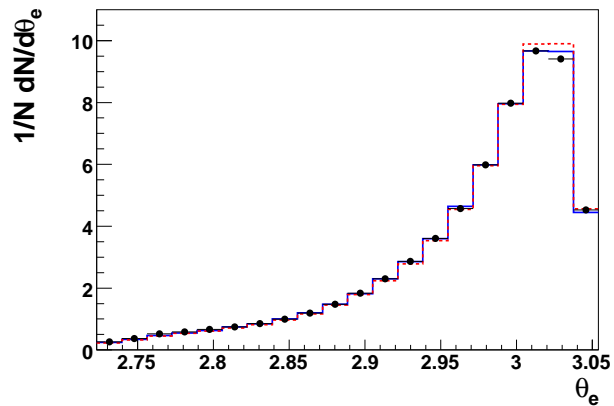
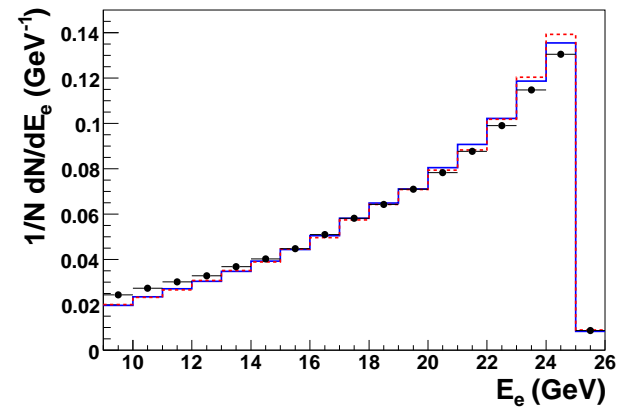
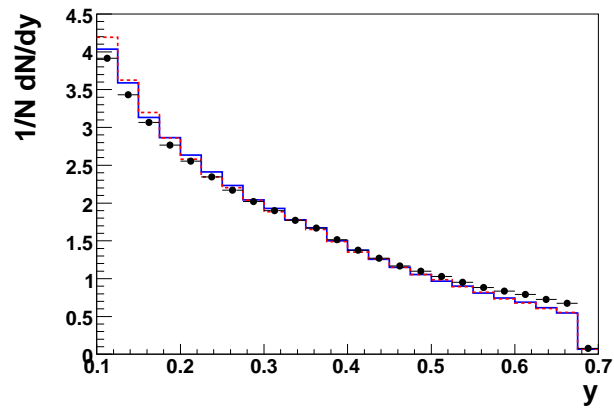
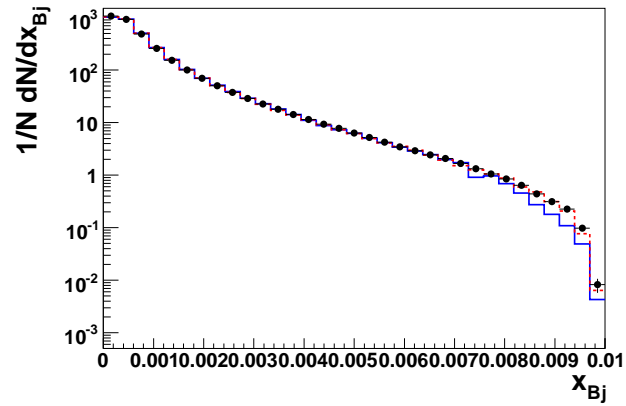
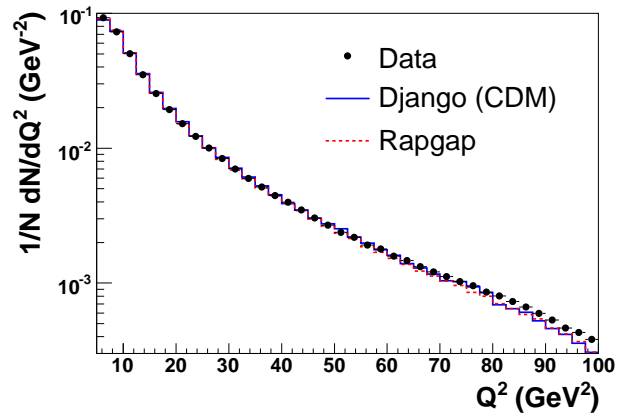
Cascade

Lepto (CDM)

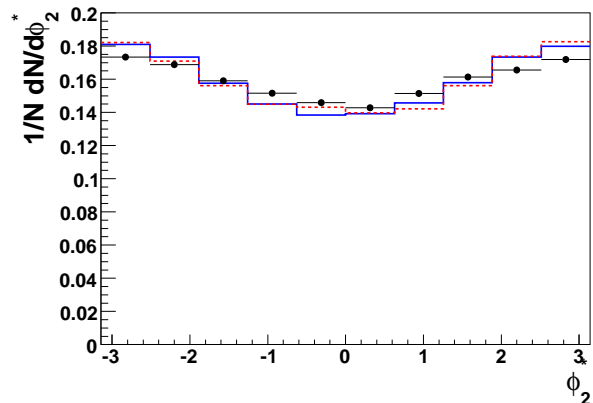
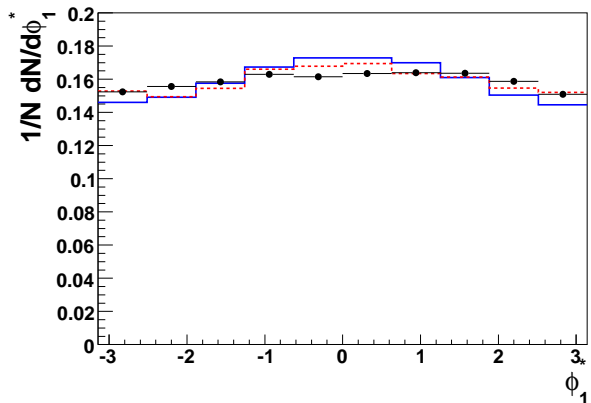
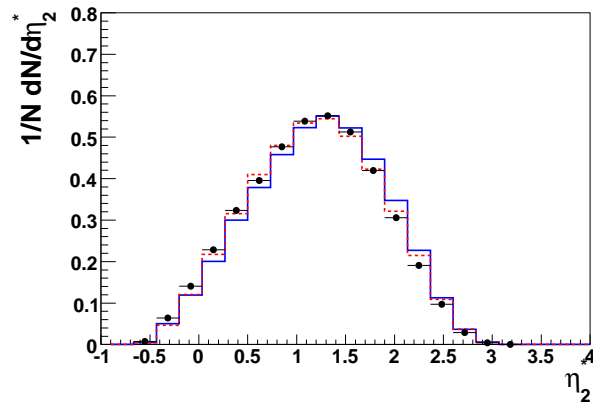
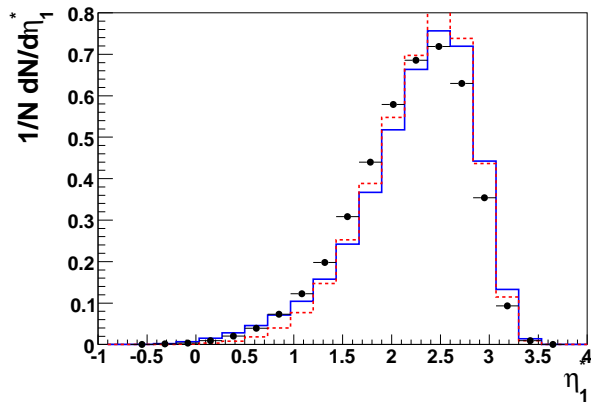
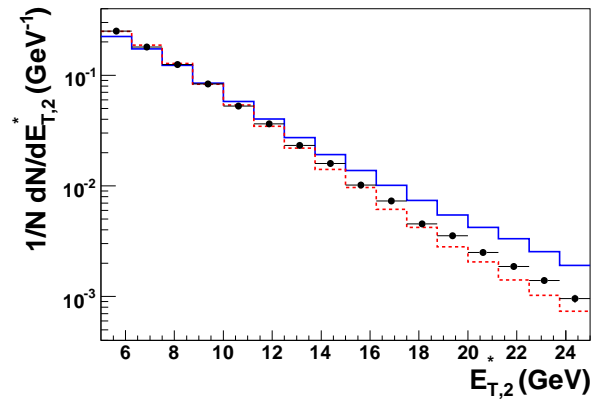
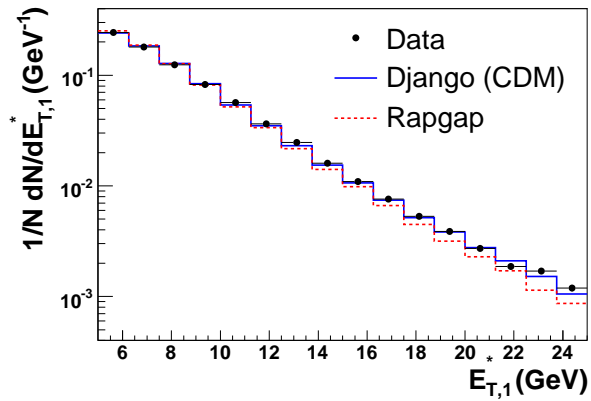


Rapgap (Dir) and Django (CDM) are used for corrections

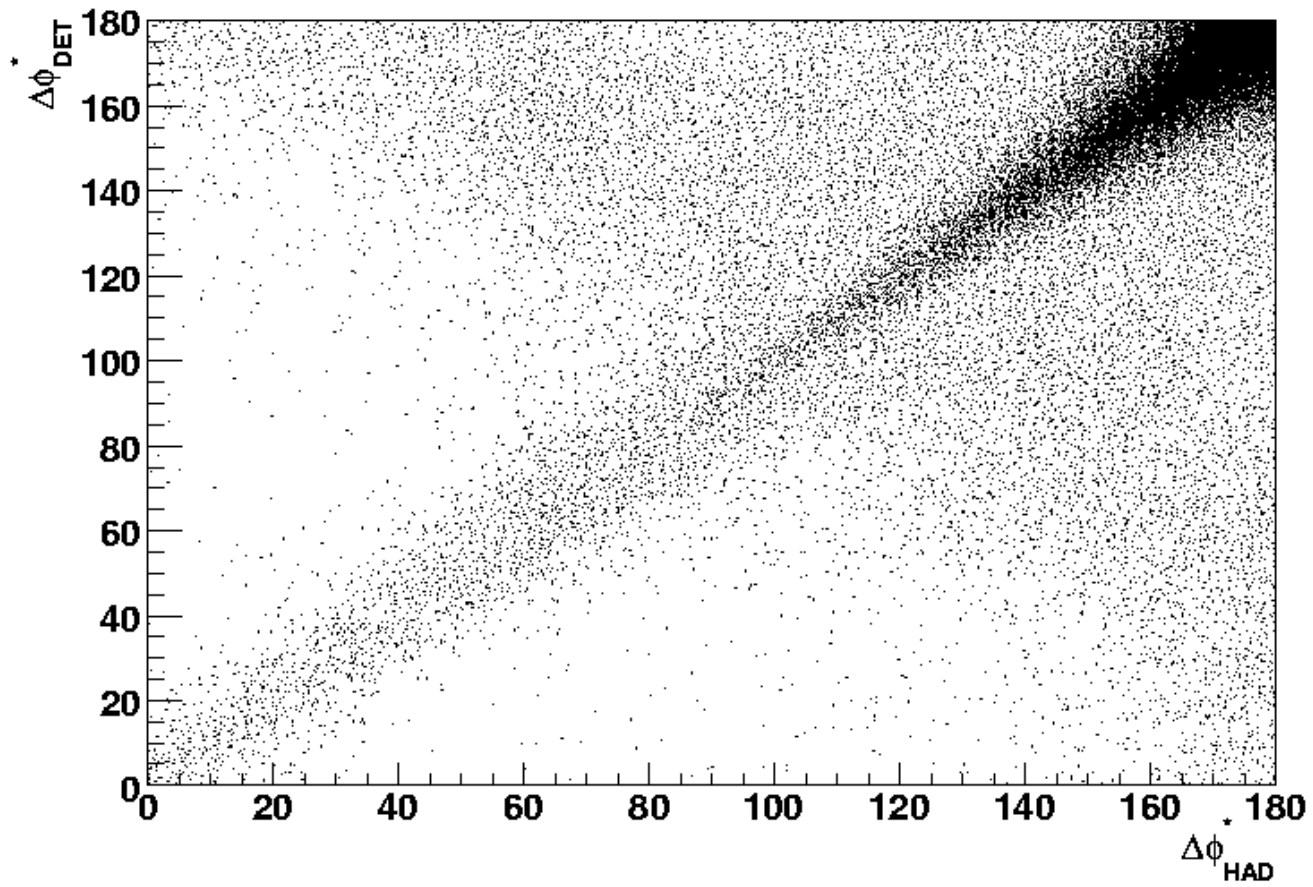
# Control Plots DIS Sample



# Control Plots Dijets

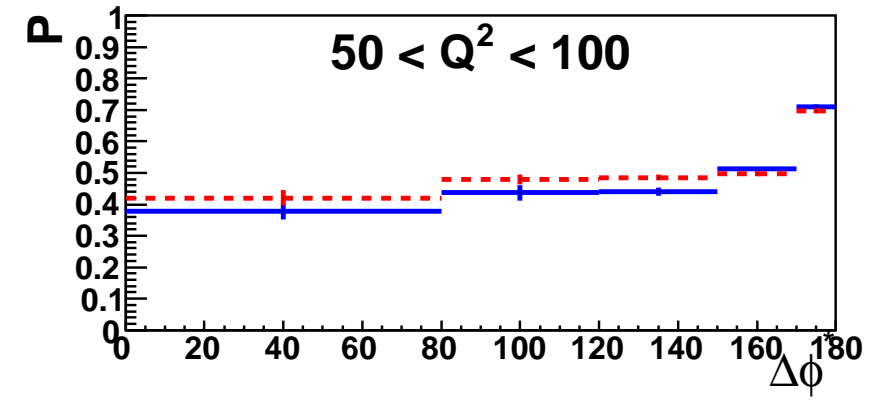
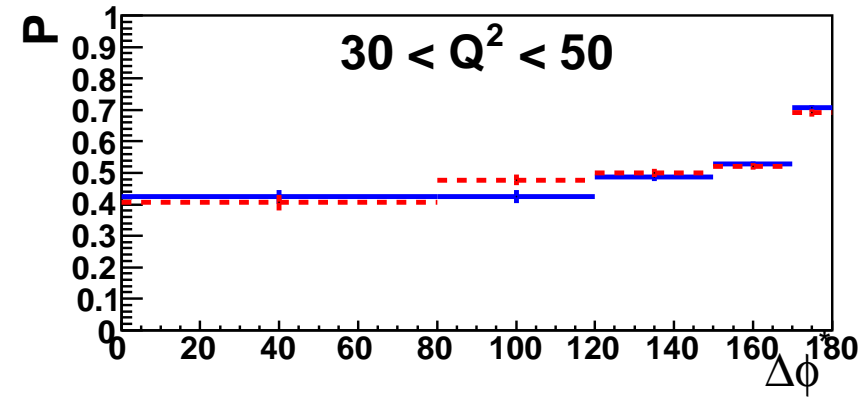
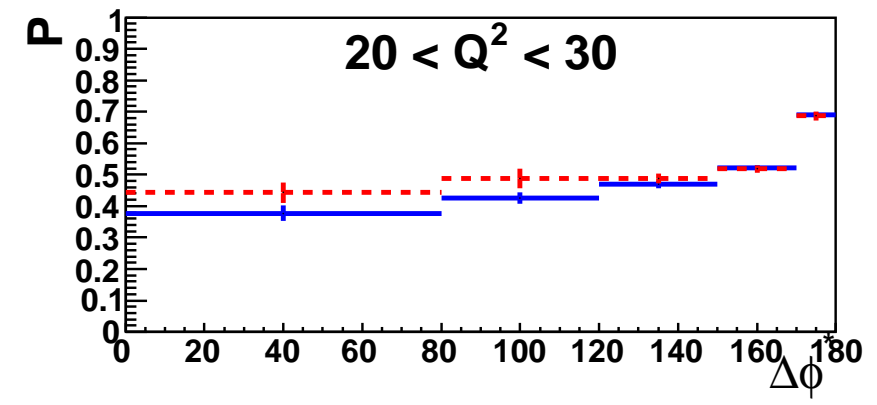
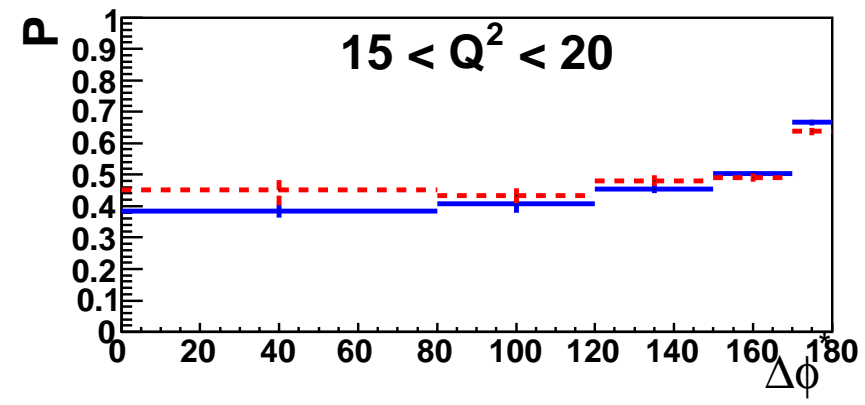
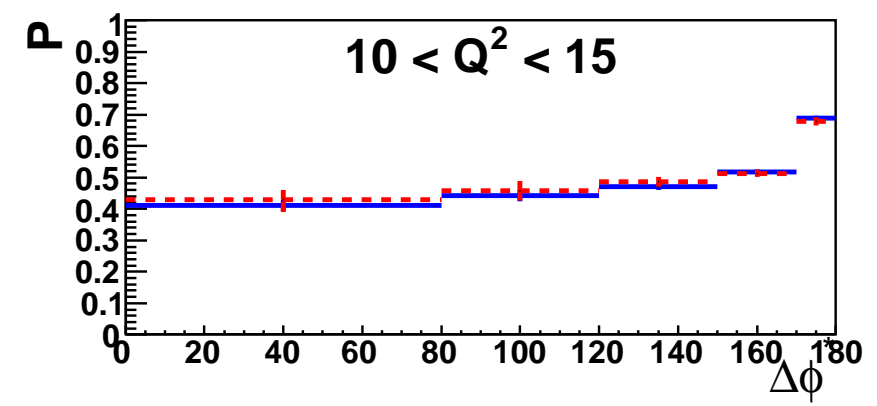
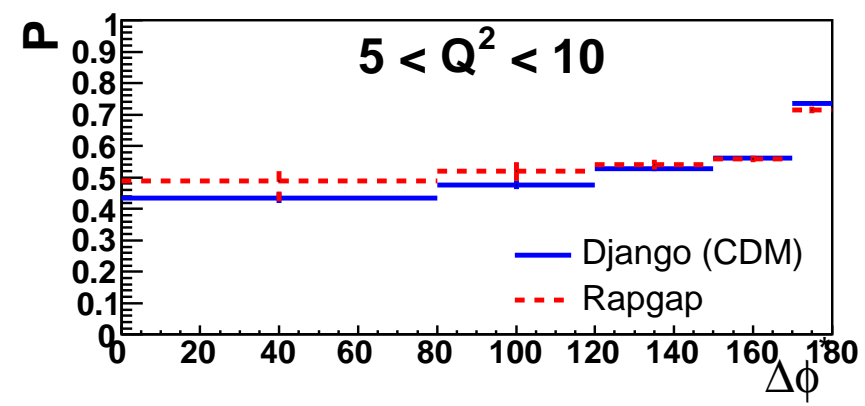


$\Delta\phi^*$  correlation



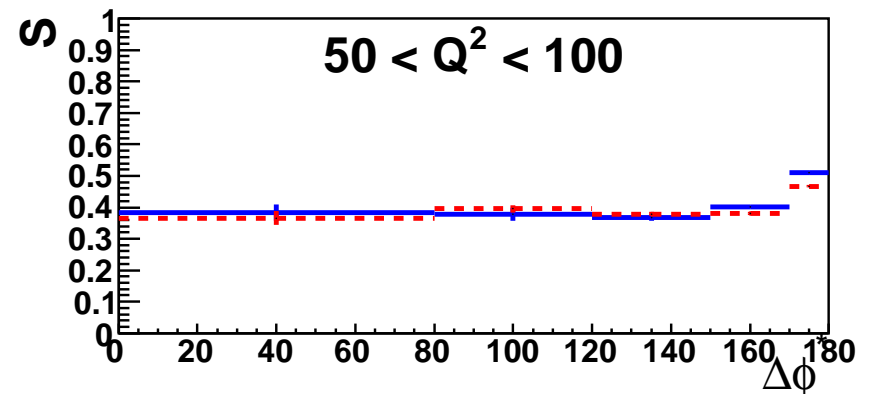
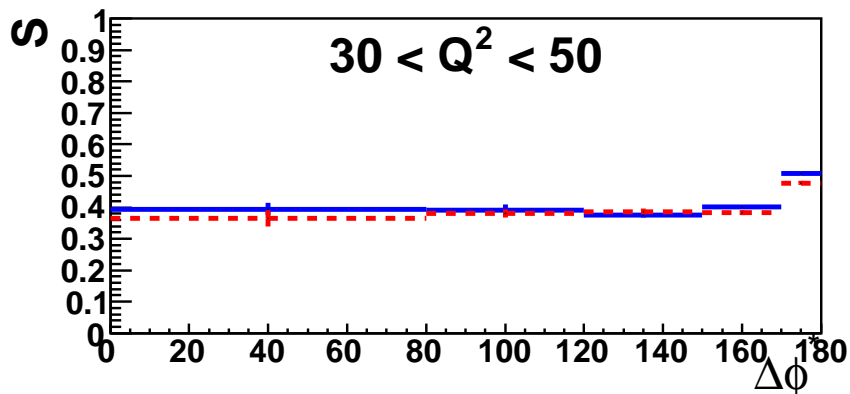
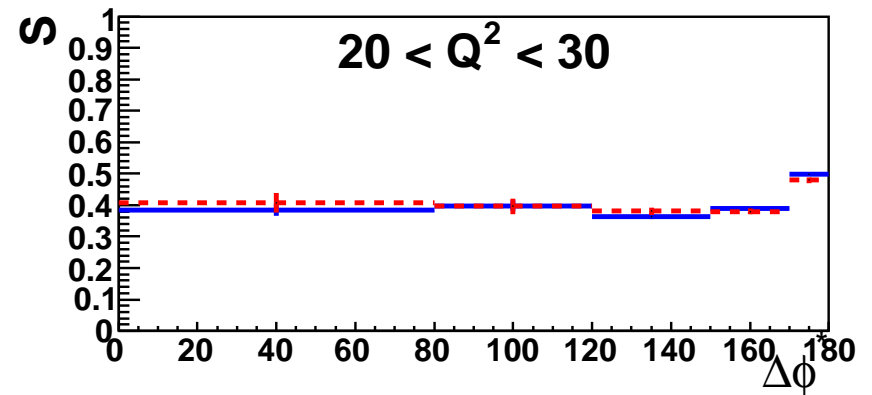
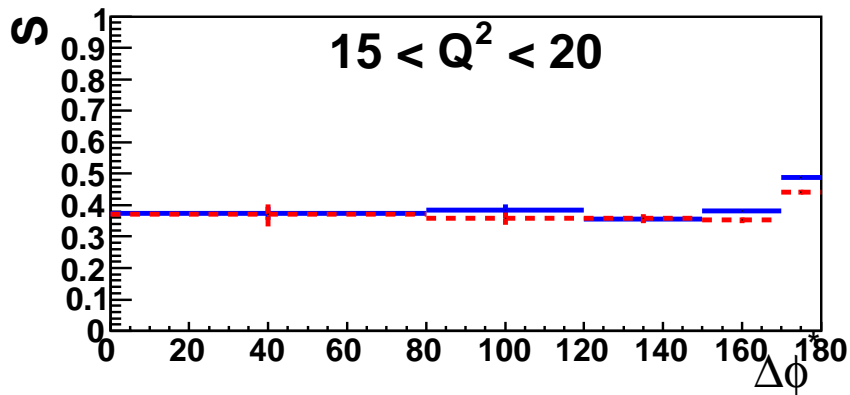
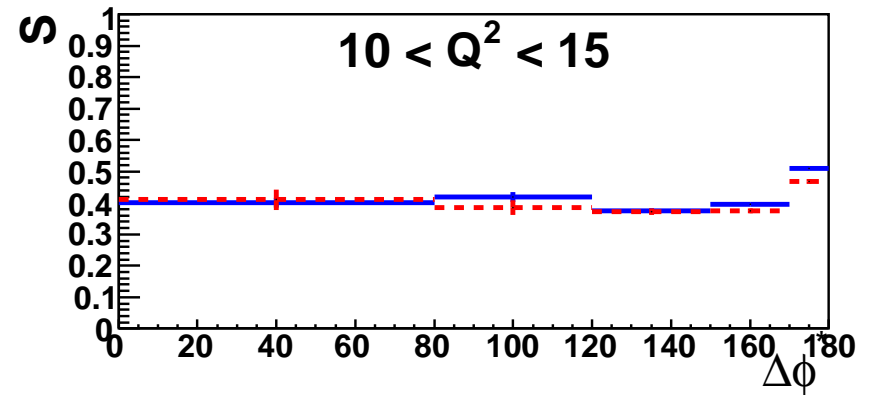
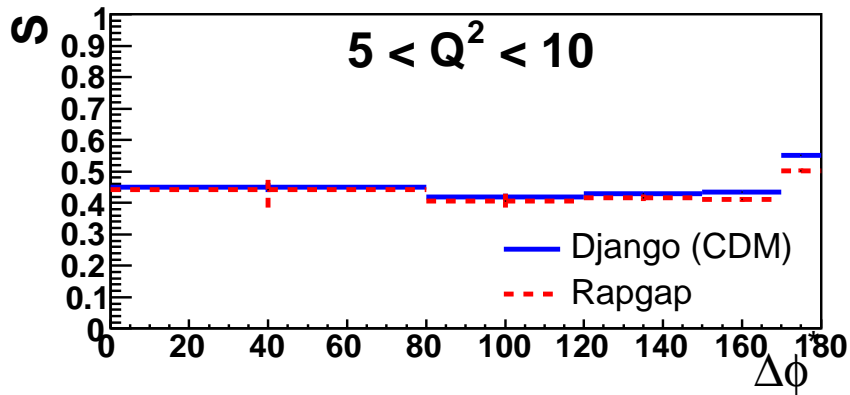
$d\sigma/dQ^2 d\Delta\phi^*$  Purity

$$P = \frac{N_{DET\&\&HAD}}{N_{DET}}$$



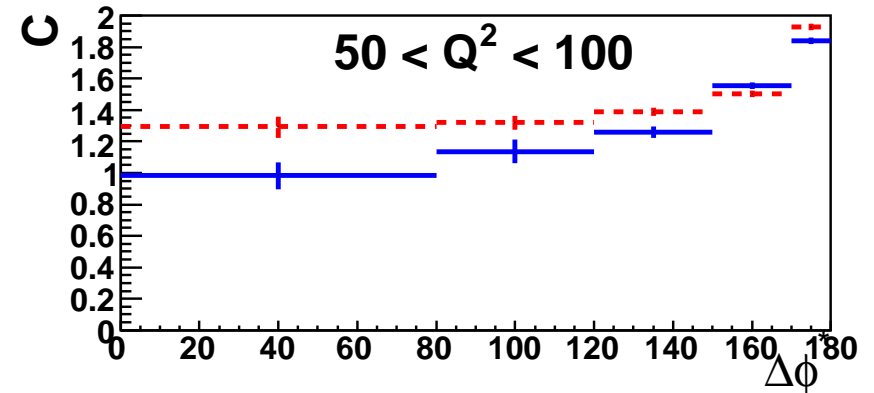
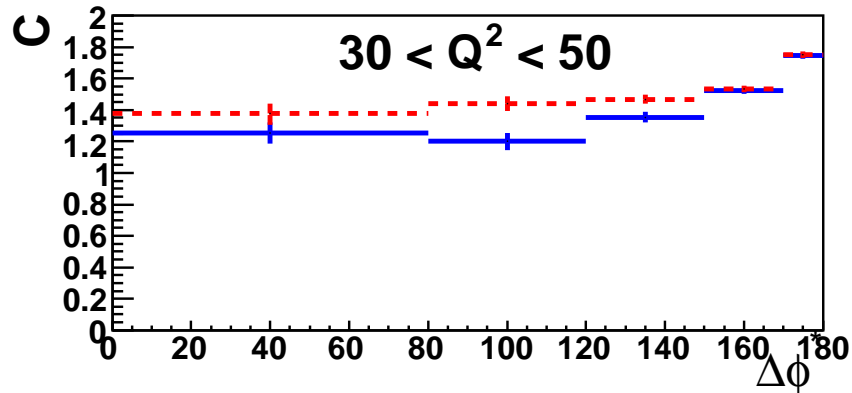
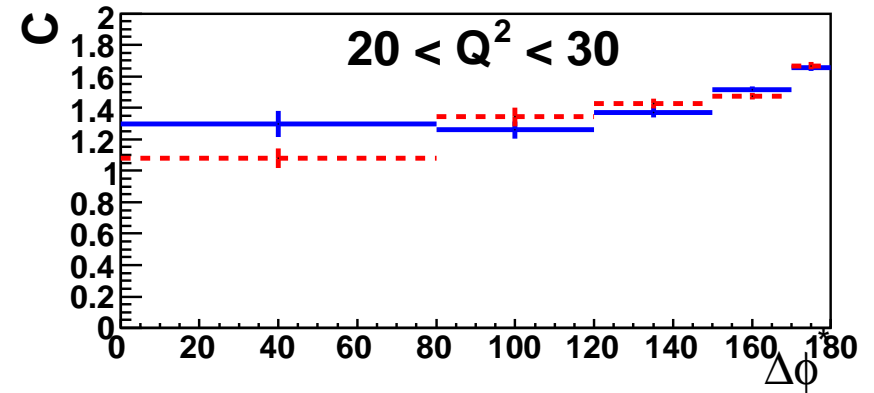
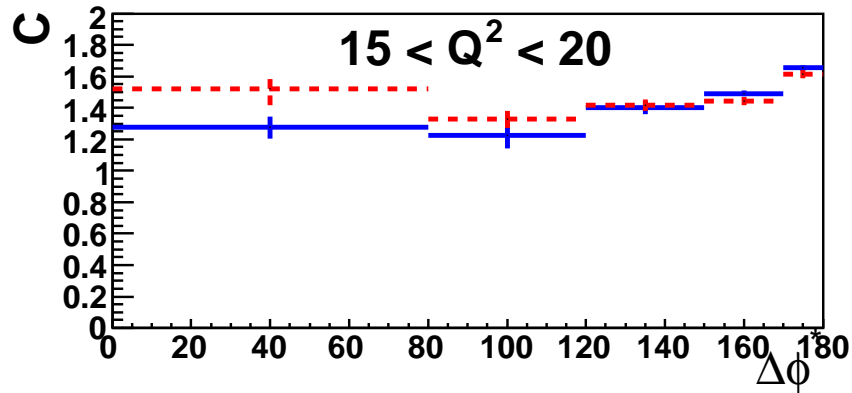
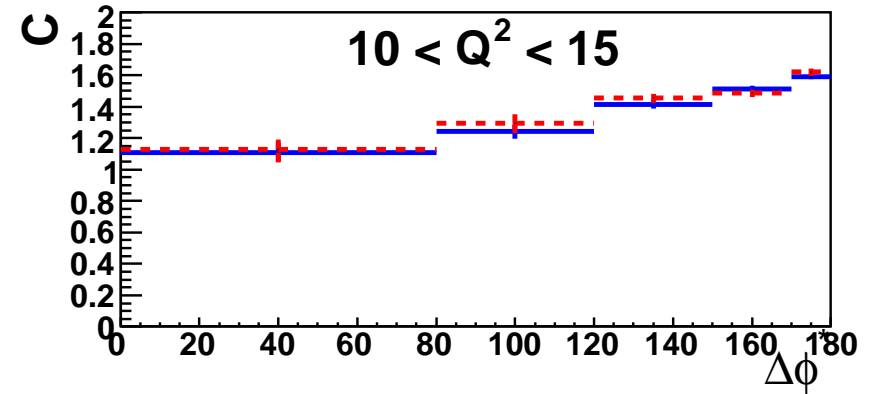
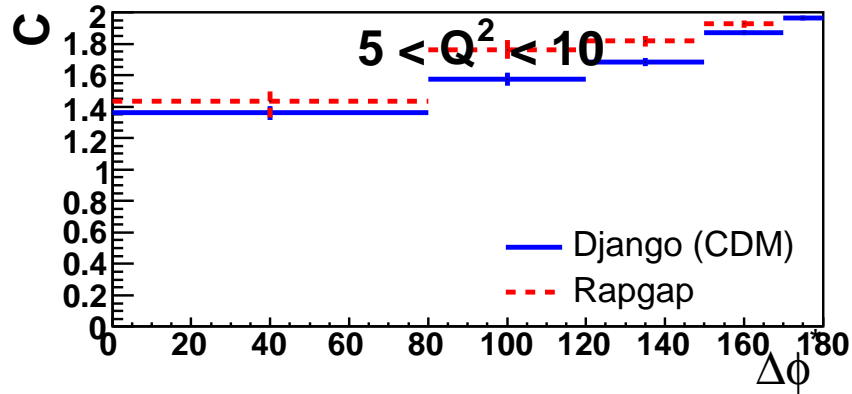
$d\sigma/dQ^2 d\Delta\phi^*$  Stability

$$S = \frac{N_{DET\&\&HAD}}{N_{HAD}}$$



# $d\sigma/dQ^2 d\Delta\phi^*$ Corrections

$$C = \frac{N_{HAD, NONRAD}}{N_{DET}}$$



$$d\sigma / dQ^2 d\Delta\phi^*$$

## Systematic Uncertainties

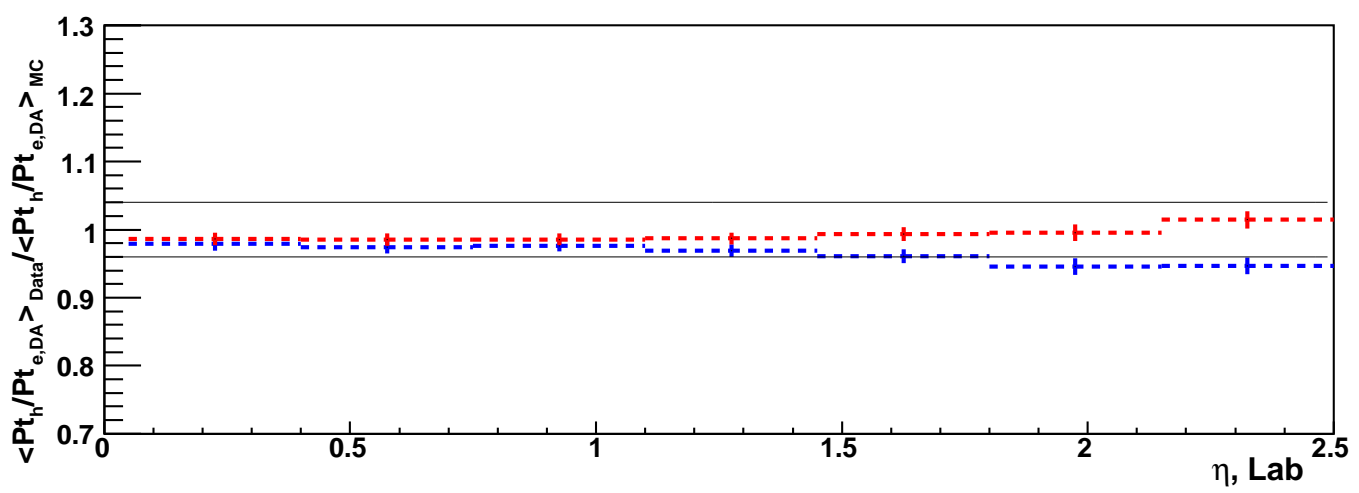
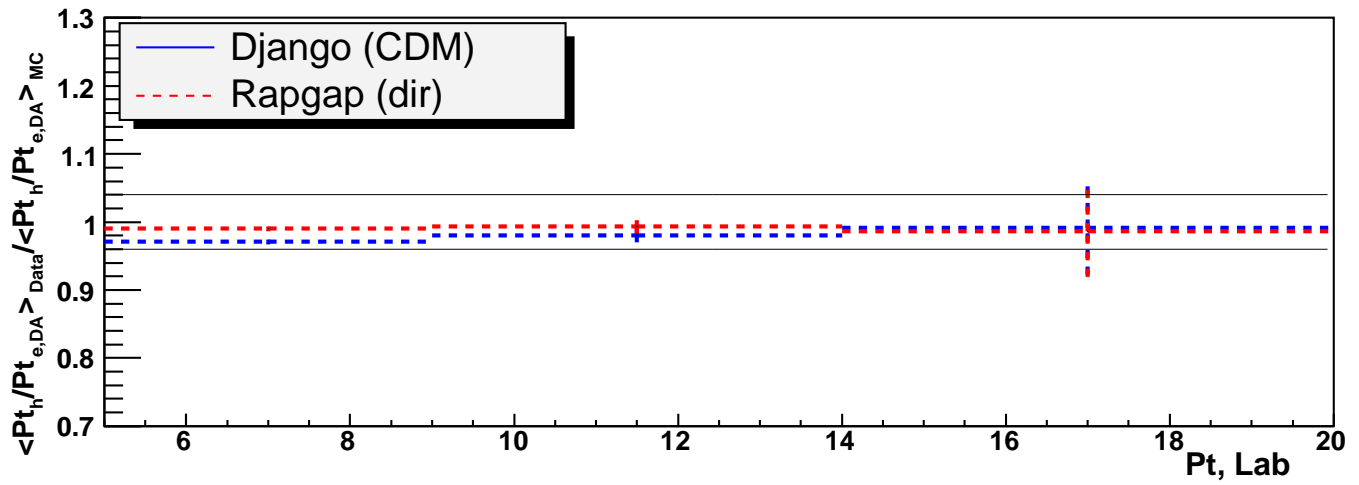
Estimated using Rapgap

... except model dependence:  $\frac{|C_{Rapgap} - C_{Django}|}{2}$

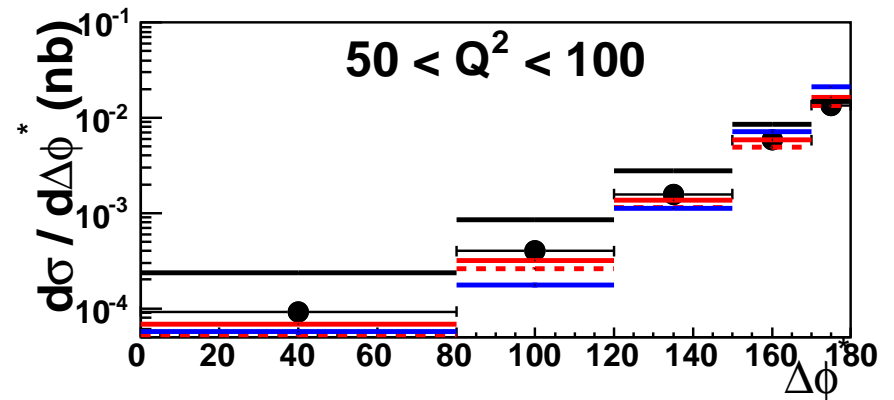
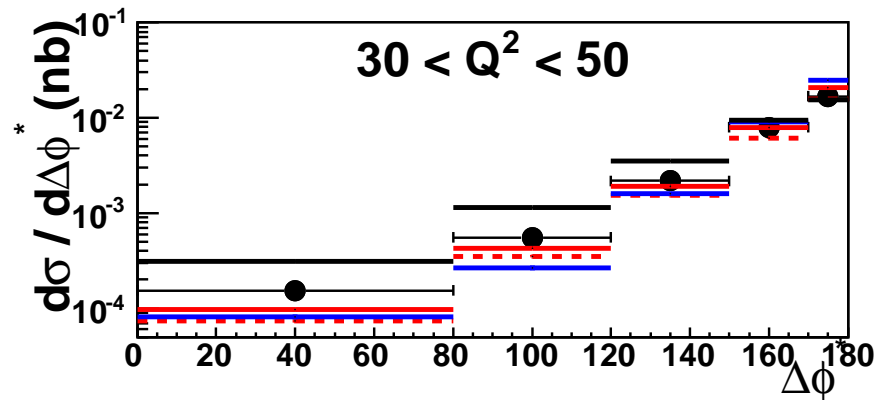
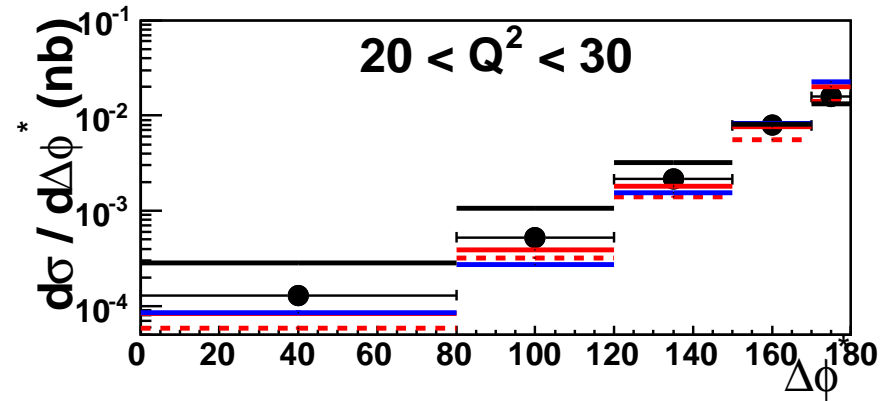
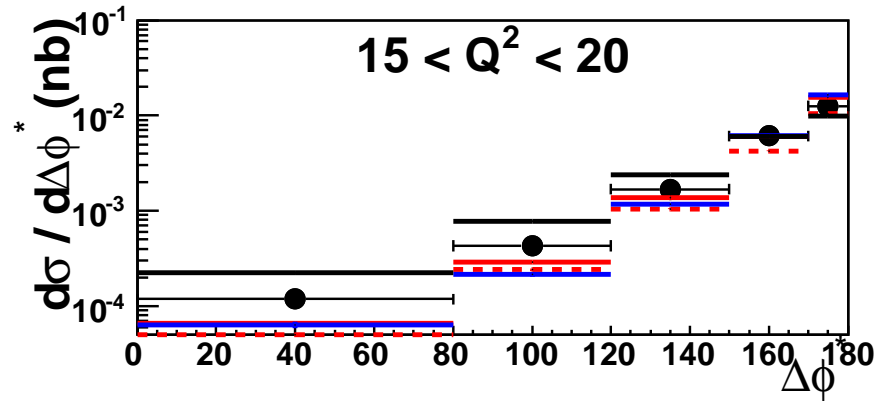
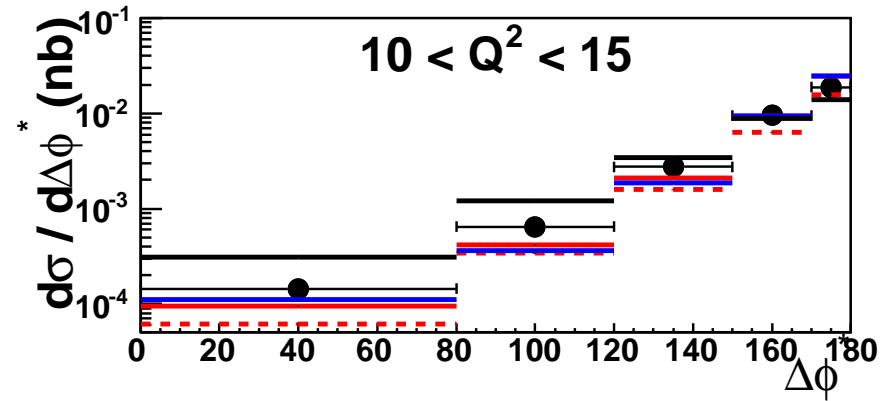
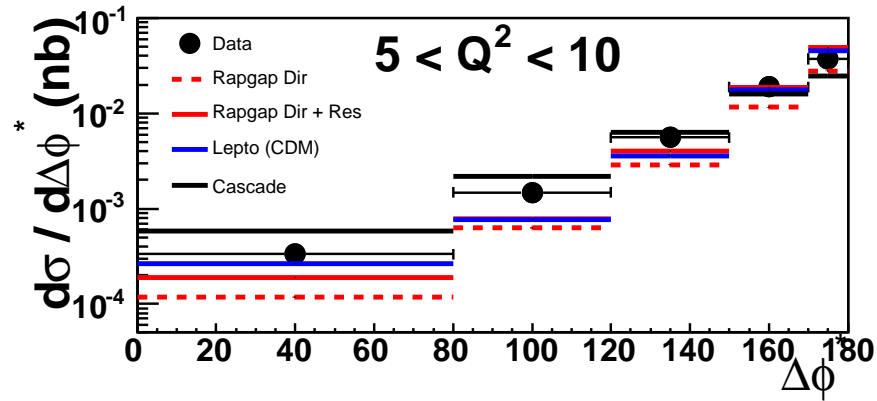
Source		Typical Uncertainty
Electron Energy	$\pm 1\%$	0.5 - 1.7 %
Electron Polar Angle $\theta_e$	$\pm 1$ mrad	0.3 - 0.9 %
LAr Hadronic Energy	$\pm 4\%$	} 1 - 8 %
SPACAL Hadronic Energy	$\pm 5\%$	
Track Momentum	$\pm 3\%$	
Model Dependence		2 - 10 %

$d\sigma / dQ^2 d\Delta\phi^*$

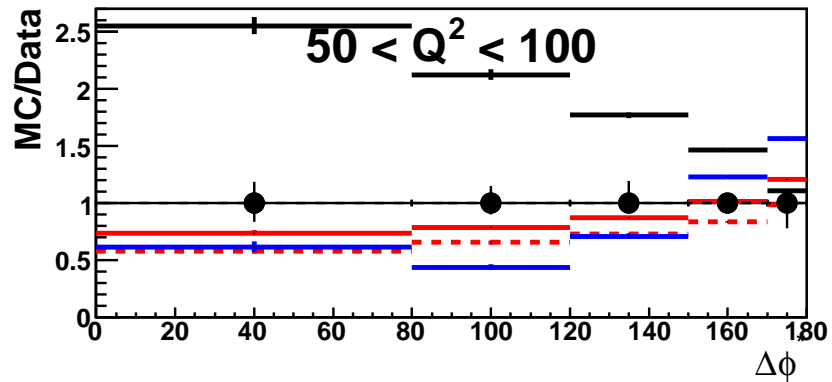
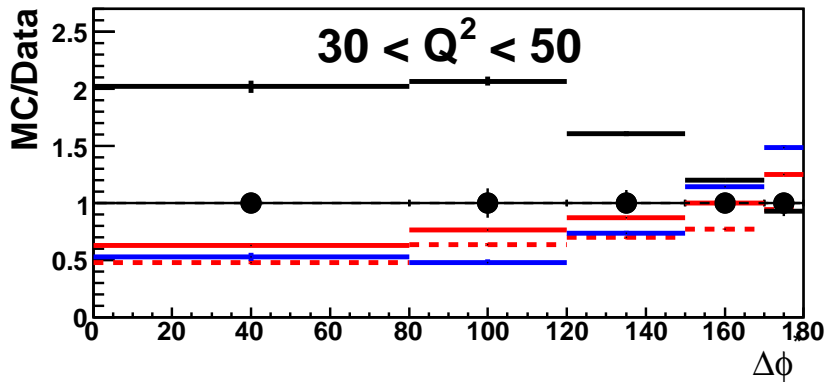
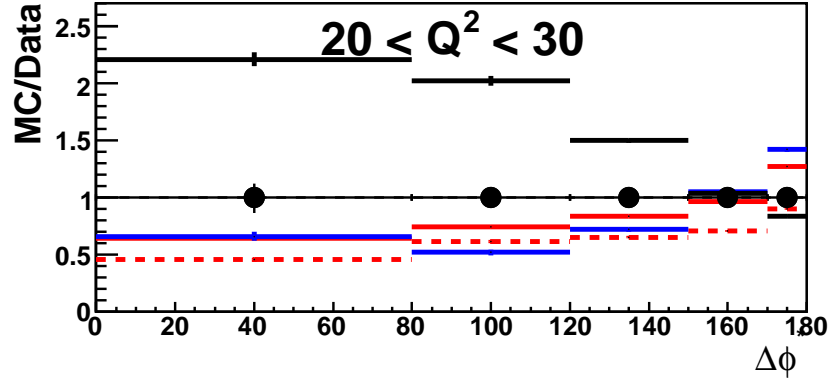
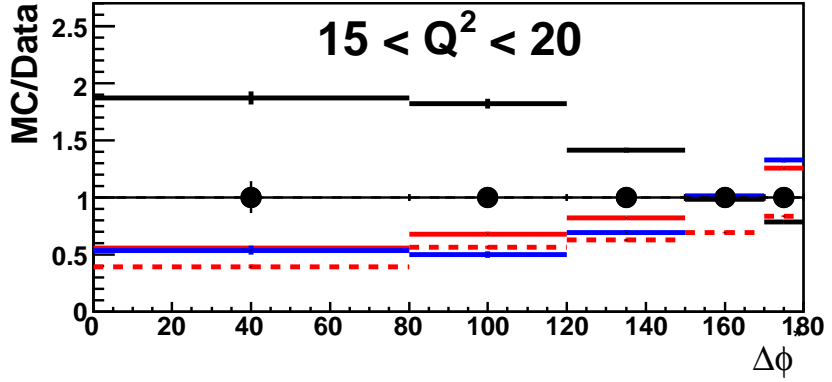
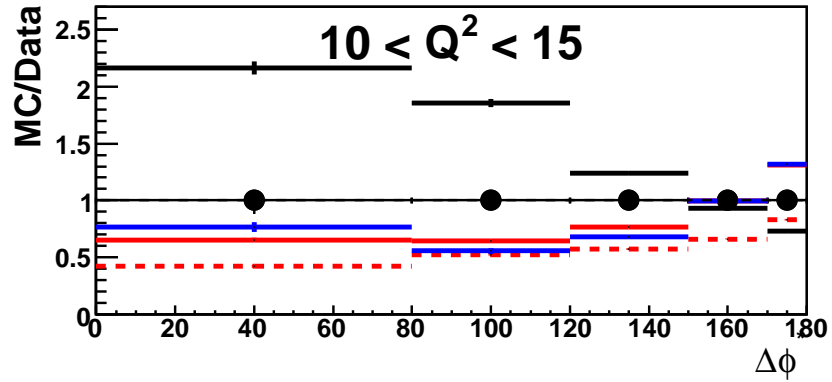
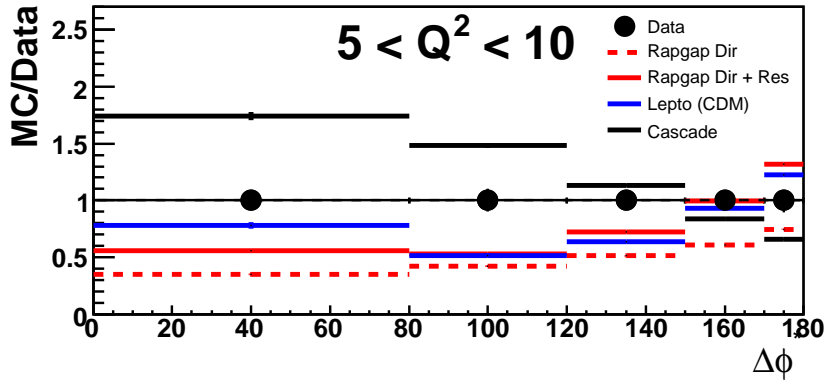
**Systematic Uncertainties**



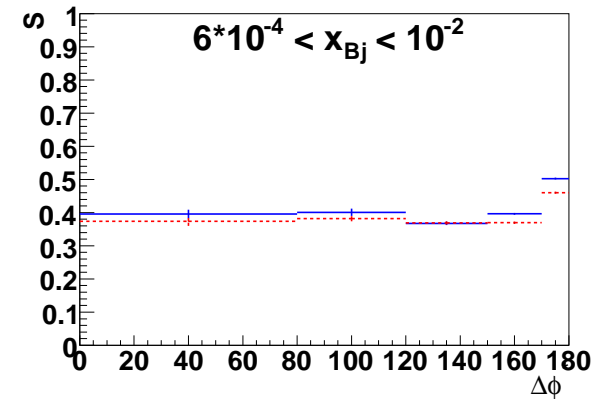
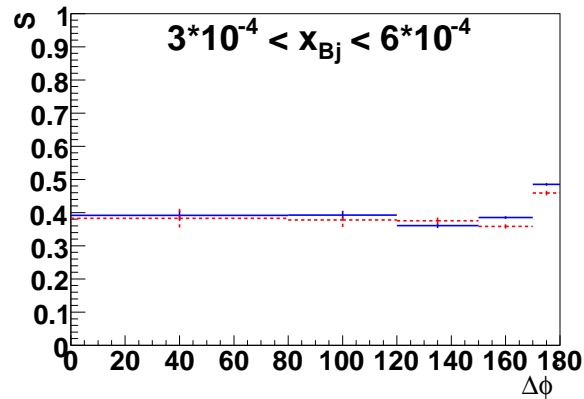
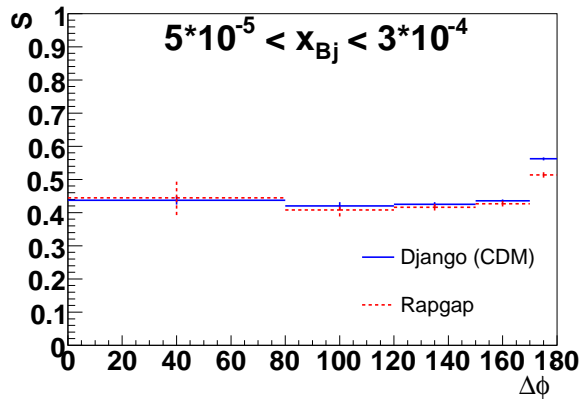
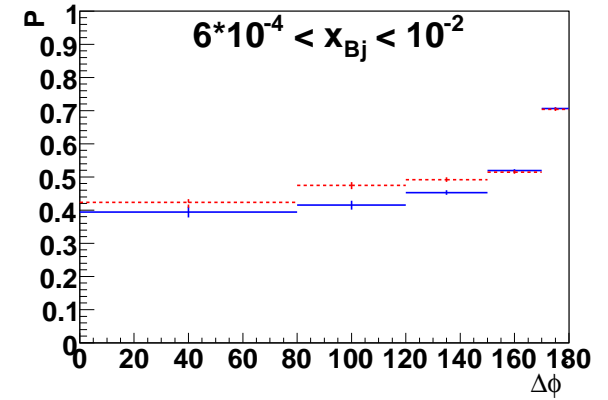
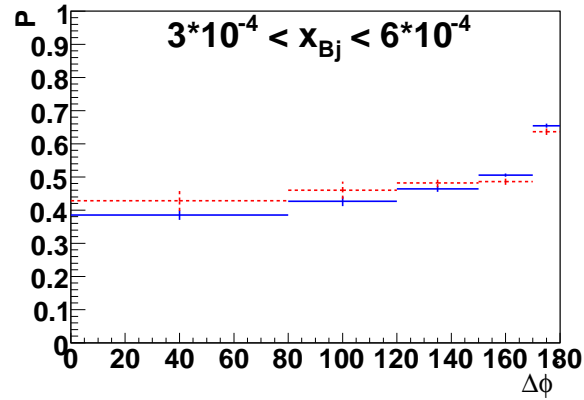
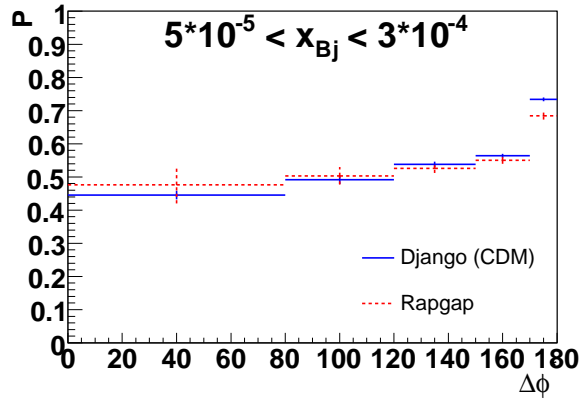
$$d\sigma / dQ^2 d\Delta\phi^*$$



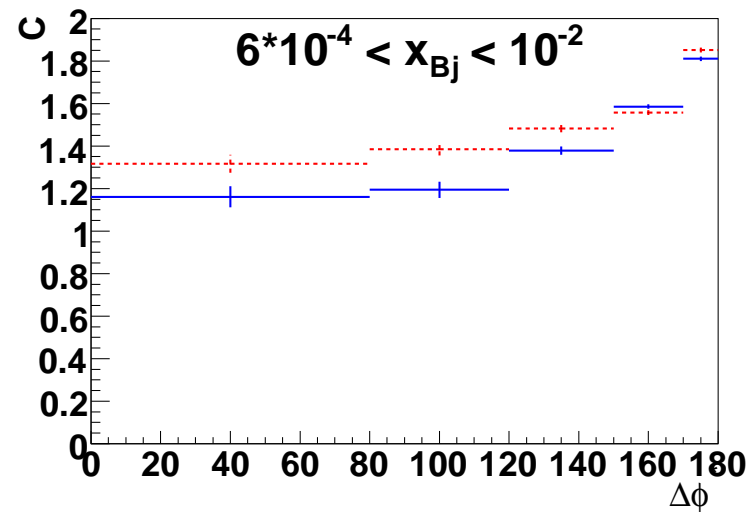
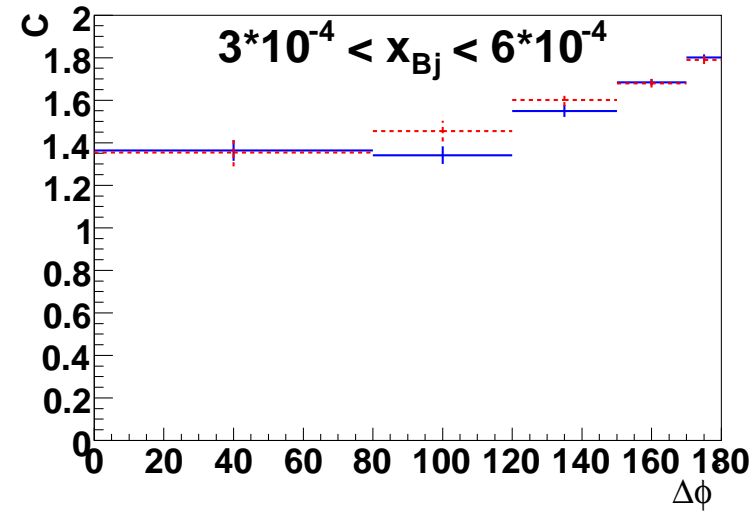
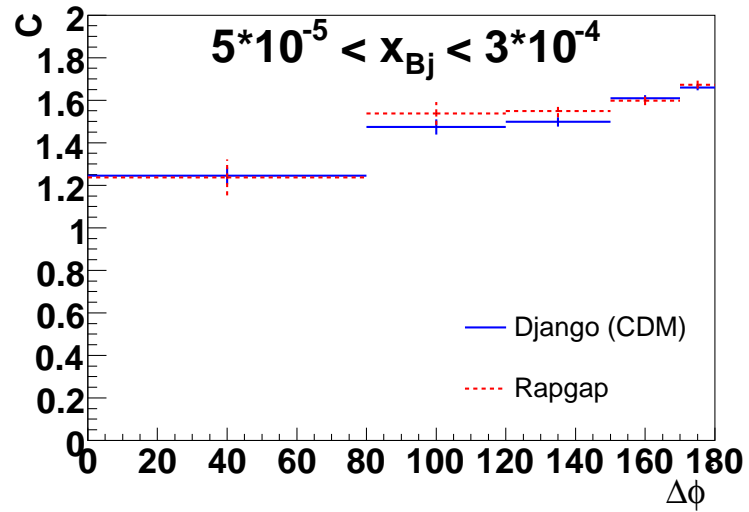
# $d\sigma/dQ^2 d\Delta\phi^*$ Ratio



# $d\sigma/dx_{bj}d\Delta\phi^*$ Purity and Stability



# $d\sigma/dx_{bj}d\Delta\phi^*$ Corrections



$$d\sigma / dx_{bj} d\Delta\phi^*$$

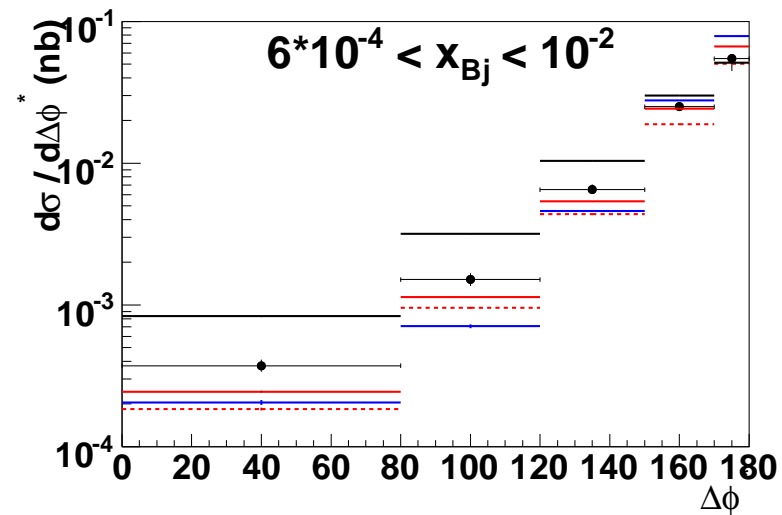
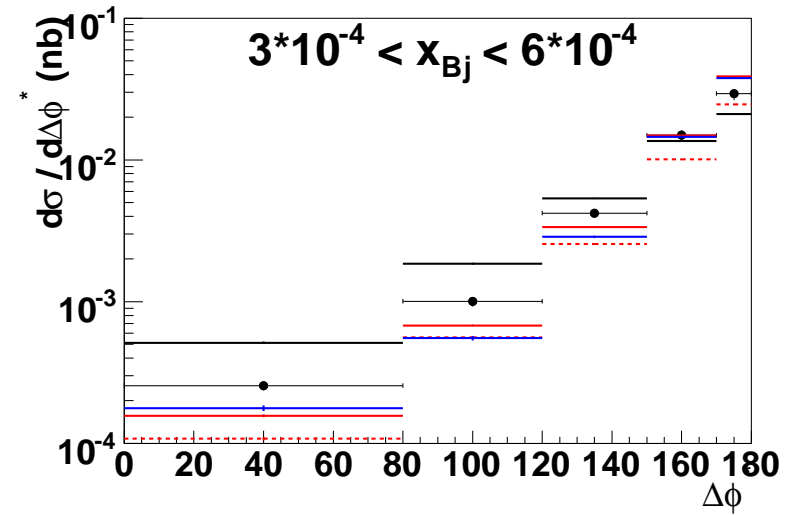
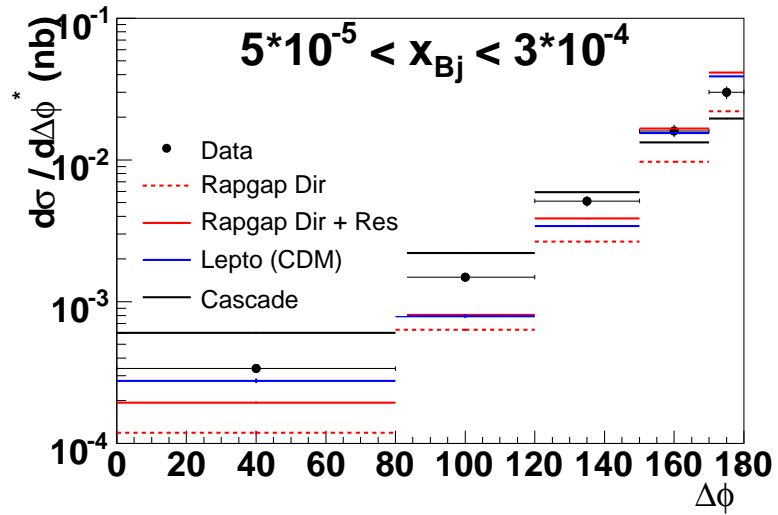
## Systematic Uncertainties

Estimated using Rapgap

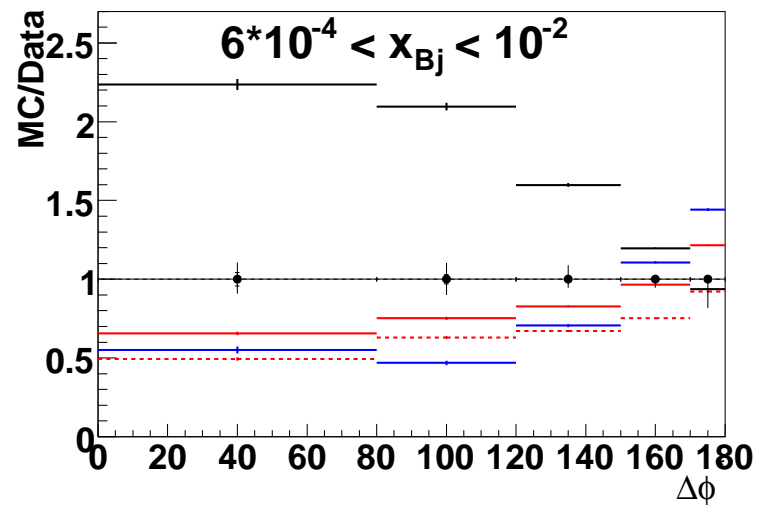
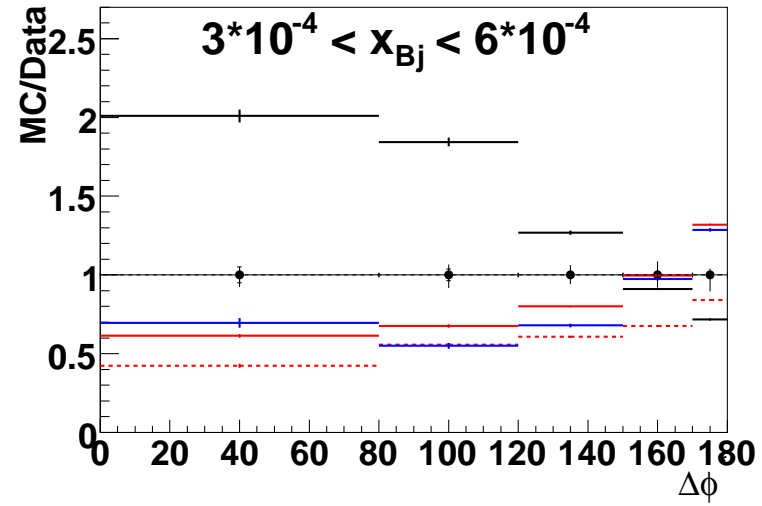
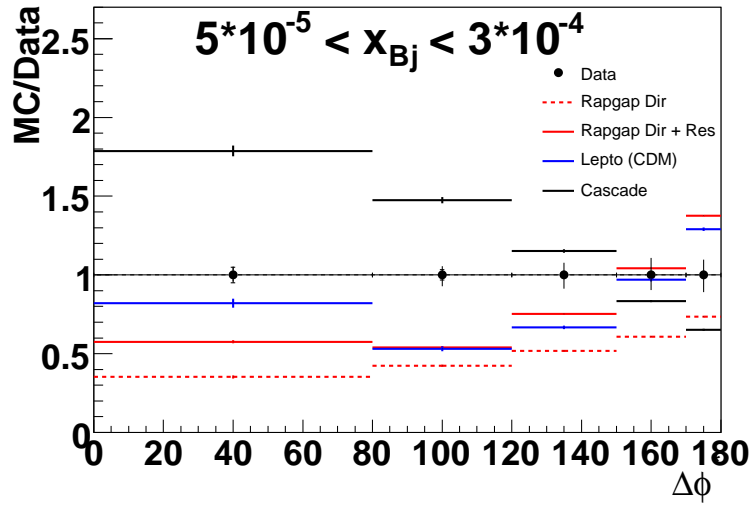
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SPACAL Hadronic Energy	$\pm 5\%$	
Track Momentum	$\pm 3\%$	
Model Dependence		2 - 10 %

$$d\sigma / dx_{bj} d\Delta\phi^*$$



# $d\sigma/dx_{bj}d\Delta\phi^*$ Ratio



# Summary

- Azimuthal correlations measured in bins of  $Q^2$  and in bins of  $x_{Bj}$
- Data ready soon
- Aiming for preliminary to DIS06