Thoughts on ATHENA inclusive group work plan

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Most pressing question: What do we actually need to evaluate for detector configuration benchmarking

Also: what else should we aim to do for proposal?

HERA (well, H1) systematic sources

Typically (though every detector / measurement different) …

Point-to-point correlated sources:

- Electron energy scale
- Electron angle
- Hadronic energy scale / noise
- Photoproduction background (~ electron ID)
- Luminosity

Uncorrelated sources:

- Various efficiencies (electron track, vertexing, trigger)
- Radiative corrections
- Additional low y (< 0.01) effects

Summary / simplified version for Yellow Report studies →

N.C. systematic uncertainties

	Point-to-Point (%)	Normalization (%)
Statistics (10 fb^{-1})	0.01-0.35	-
Luminosity	-	~1
Electron Purity	-	~1 (for 90% purity)
Bin-Centering	<0.5	<0.5
Radiative Corrections (*HERA*)	1	-
Acceptance / Bin-Migration + Trigger & Tracking Eff. + Charge-Symmetric Background	1-2	2-4
Additional uncertainty for y<0.01 bins	2	-
Total	1.5-2.3 (2.5-3 for y<0.01)	2.5-4.3

Dominant sources at H1

Intermediate y (electron method works well, electron ID unproblematic):

- electron energy scale

High y (low E'_e, hadrons dominantly in outgoing electron direction, radiative corrections explode for electron method):

- photoproduction background

Low y (high E'_e, electron method resolution poor, hadrons dominantly in outgoing proton direction)

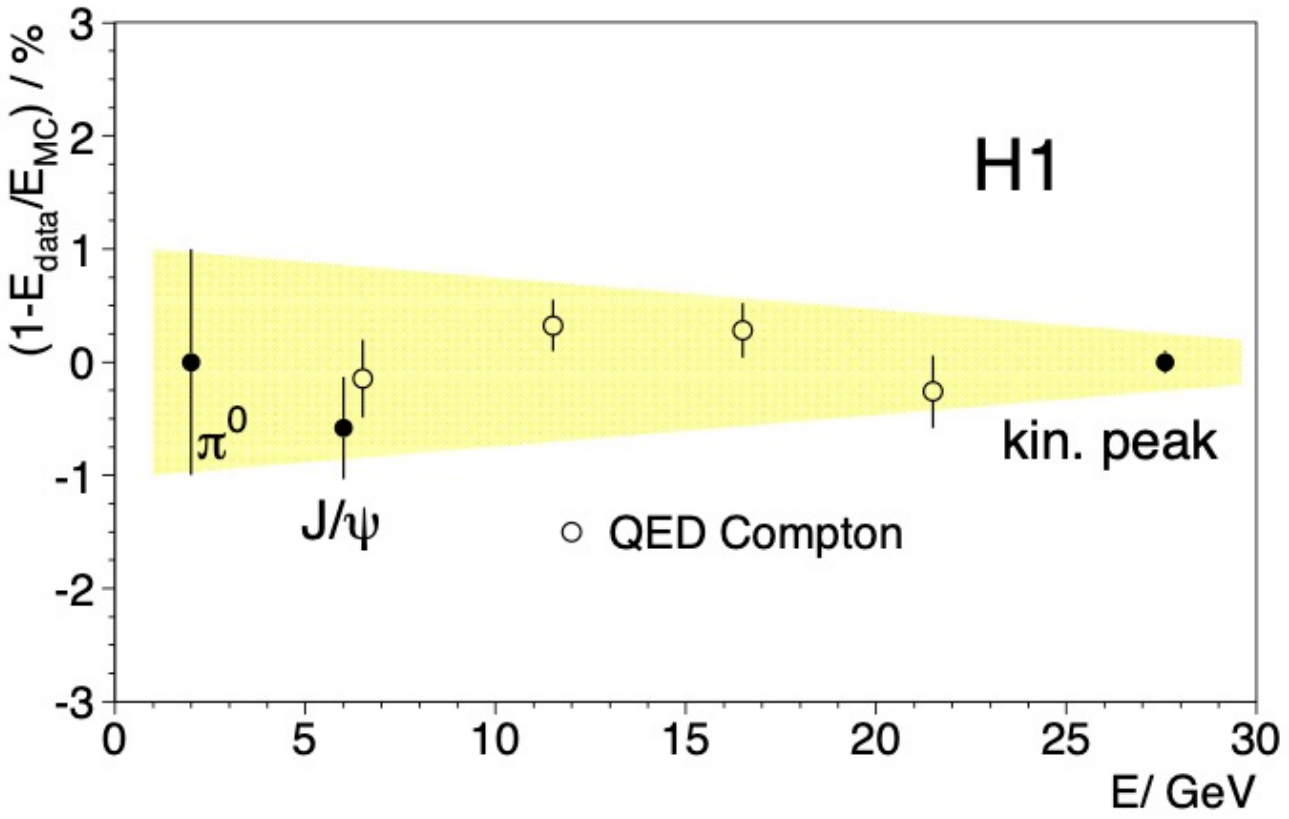
- hadronic energy scale / noise

Notes:

- Hadronic energy scale calibrated against the electron … so depends on electron energy scale as well as response to hadrons

- Photoproduction background was a modelling uncertainty (dedicated γp MCs such as PHOJET) … background mostly fake electrons

e.g. Electron Energy Scale Calibration



Precision depends on statistics for various studies as well as electron energy resolution

What to evaluate for benchmarking?

- Resolution in (x,Q^2) with e,h,DA,Σ methods throughout full kinematic phase space

- Electron ID efficiency and background contamination

- Resolution on electron energy (ECAL)

- (maybe) electron angle resolution from tracker, track reconstruction efficiency …

Other systematics not so obviously dependent on expected variations in detector design?

What else to evaluate (more for proposal)?

- Performance for low Q^2 DIS

- Dependence on magnetic field

- Sensitivity to QED radiative corrections

- Sensitivity to beam effects (crossing angle, crab rotation, beam energy spread, beam divergence, bunch length)

- Propagation to PDF sensitivity?