A$_N$DY Status
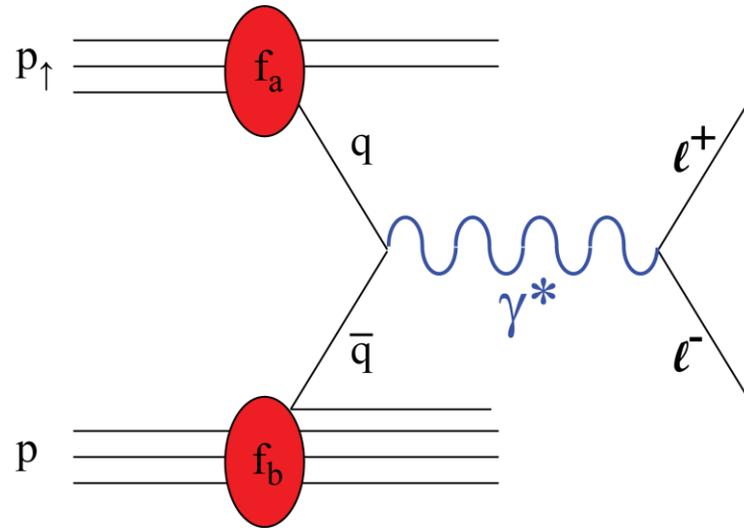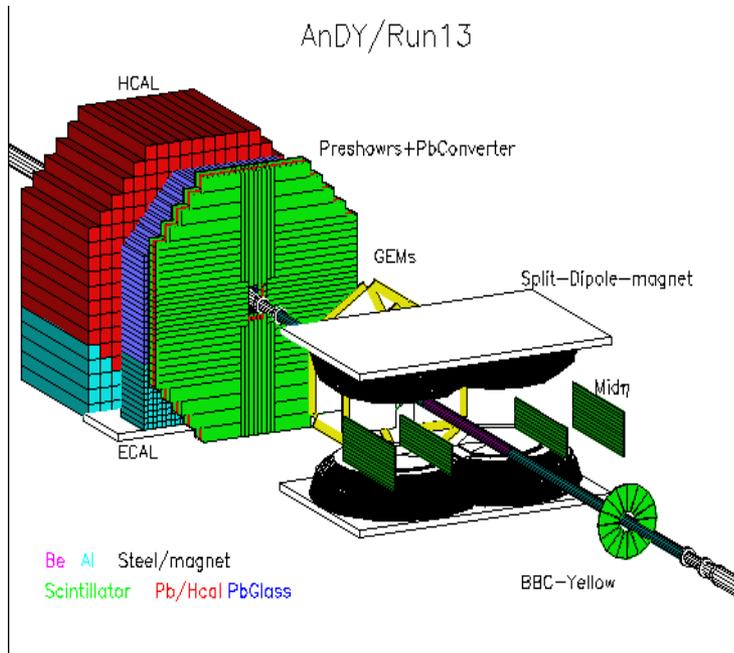
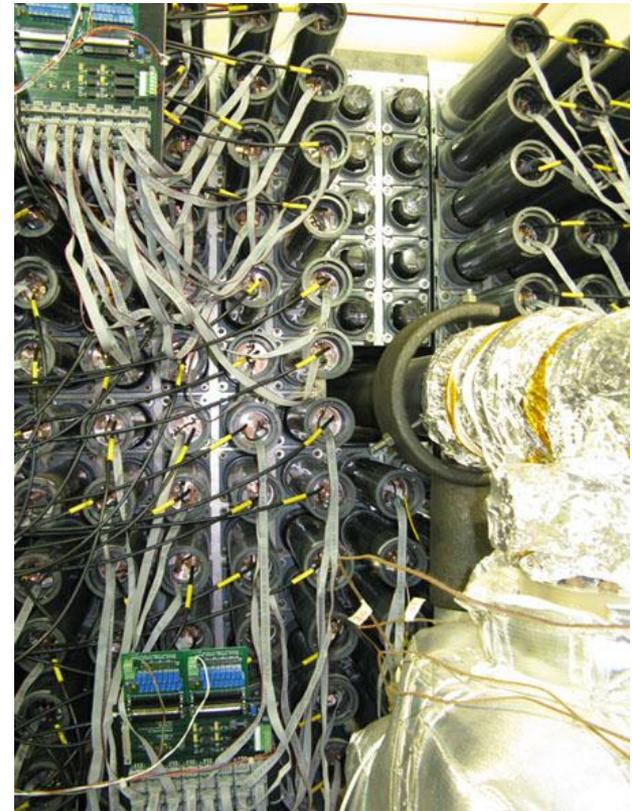## Commissioning with colliding beams

L.C.Bland, for AnDY

28 February 2012

Time Meeting, BNL

Changes to A$_N$DY for Run-12

GEANT model of proposed A$_N$DY apparatus (run-13)

Thanks to C.Folz, et al.

- Proposed A$_N$DY detector (left), as submitted, consists of annular ECal, annular HCal, preshower + tracking through the (modified) PHOBOS split-dipole

- The HCal module pair used in run 11 was modified to become an annular 12-row x 20 column HCal for run 12. The picture to the right shows the phototube (PMT) end of HCal upon completion of its installation in December, before installing all PMT.

- Separated-beams test on 20120225 and 20120227 shows most things are working, and identifies some things to fix (a few holes) on the 20120229 access.
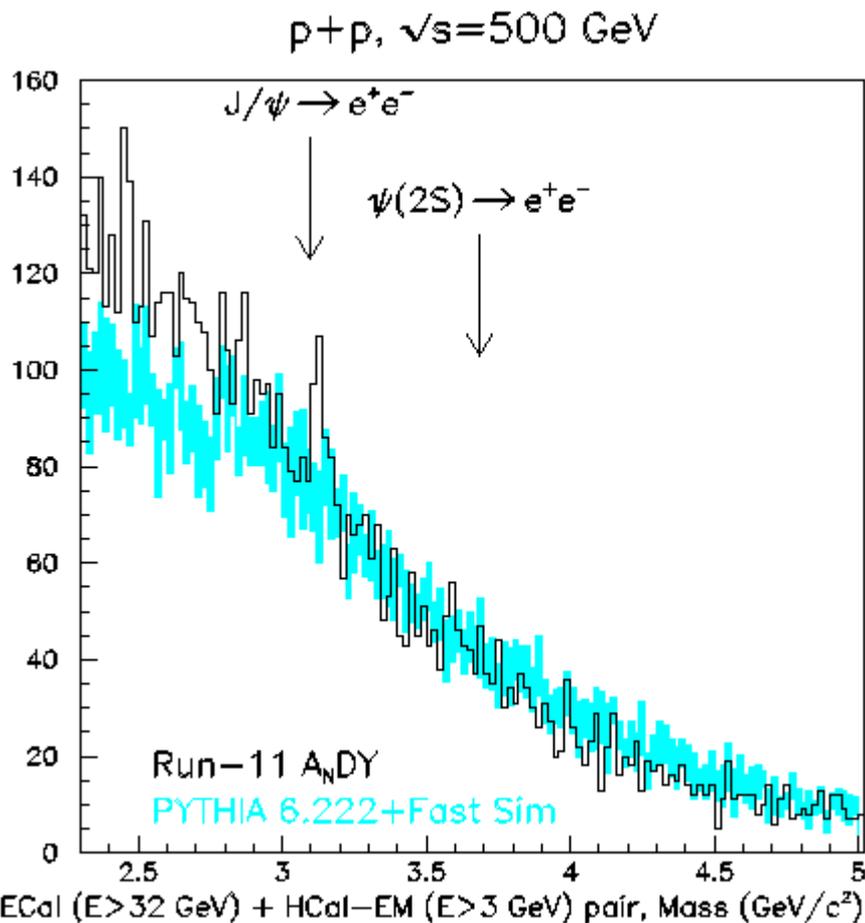
Critical Run-12 Tests

...proposed...

- *(1) Finish HCal calibration with new annulus: correction for hadronic response*

- *(2) Test operation of GEM prototype*

- *(3) Demonstrate 10 pb^{-1}/week at $\sqrt{s}$=500 GeV, as required for runs 13,14 A_NDY*

With run-12 test, becomes "measured to be"

Comments:

- *Corrections to run-11 HCal calibration for hadron showers expected to be ~20%*

- *GEMs improve position resolution from ~5cm (run-11) $\rightarrow$ ~0.1mm for calorimeter/preshower association required for **background discrimination** and other trackings*

- *Data from run-12 IP2 tests will improve run-11 J/ψ , enable B$\rightarrow$ J/ψ +K and start on concurrent $\sqrt{s}$=500 GeV A_N π^0 measurement required to determine sign of DY A_N*

Dileptons from Run 11 Data

p+p, √s=500 GeV

$J/\psi \rightarrow e^+e^-$

$\psi(2S) \rightarrow e^+e^-$

Run-11 A$_N$DY

PYTHIA 6.222+Fast Sim

ECal (E>32 GeV) + HCal-EM (E>3 GeV) pair, Mass (GeV/c^2)

Run-11 data absolutely compared to fast-simulator used for DY estimates

- *A$_N$DY profiling methods were applied to a limited data sample (L$_{int}$=0.5 / pb) of run-11 ECal triggered data.*

- *Dominant backgrounds are now from γ, and are suppressed by using MIP response of beam-beam counters to tag clusters.*

- *Individual detector $\pi^0 \rightarrow \gamma\gamma$ calibration for HCal was an essential step to reconstruct J/ψ*

- *Limited granularity of BBC and poor position resolution of HCal-EM cluster results in less photon suppression than expected for final A$_N$DY apparatus (project ~100x better suppression)*

- *Hadron suppression is not yet required, but will be in going from dileptons to DY*

- *J/$\psi \rightarrow$ e+e- peak has ~120 events with 5.4σ statistical significance. PYTHIA 6.425 with NRQCD expects 420 events in the run-11 acceptance, approximately consistent with observation after crude efficiency correction. From PYTHIA 6.425, DY with M>4 GeV/c^2 is 170x smaller in this acceptance.*

- *J/ψ is a **window to heavy flavor** via B→J/ψ K and $\Lambda_b \rightarrow$ J/ψ p $\pi-$ that would help quantify intrinsic b from proton backgrounds to DY*

Recall from run-11… Jets

arXiv:1103.1591 jet A_N measurements are required to clarify signs of quark/gluon correlators related to Sivers functions.
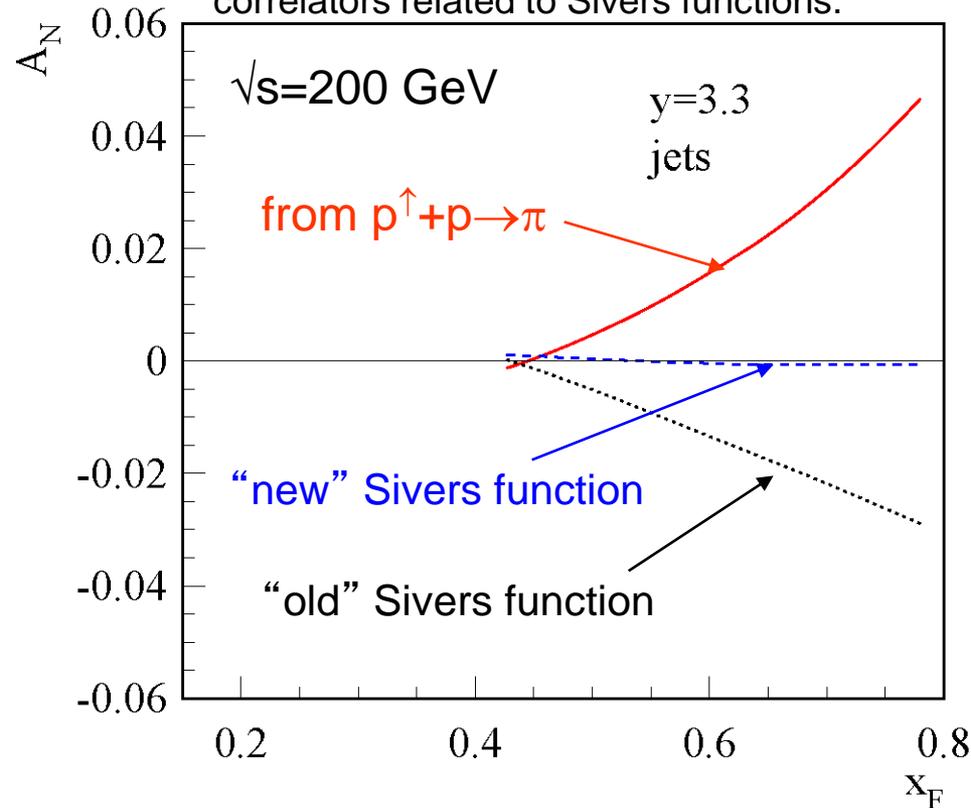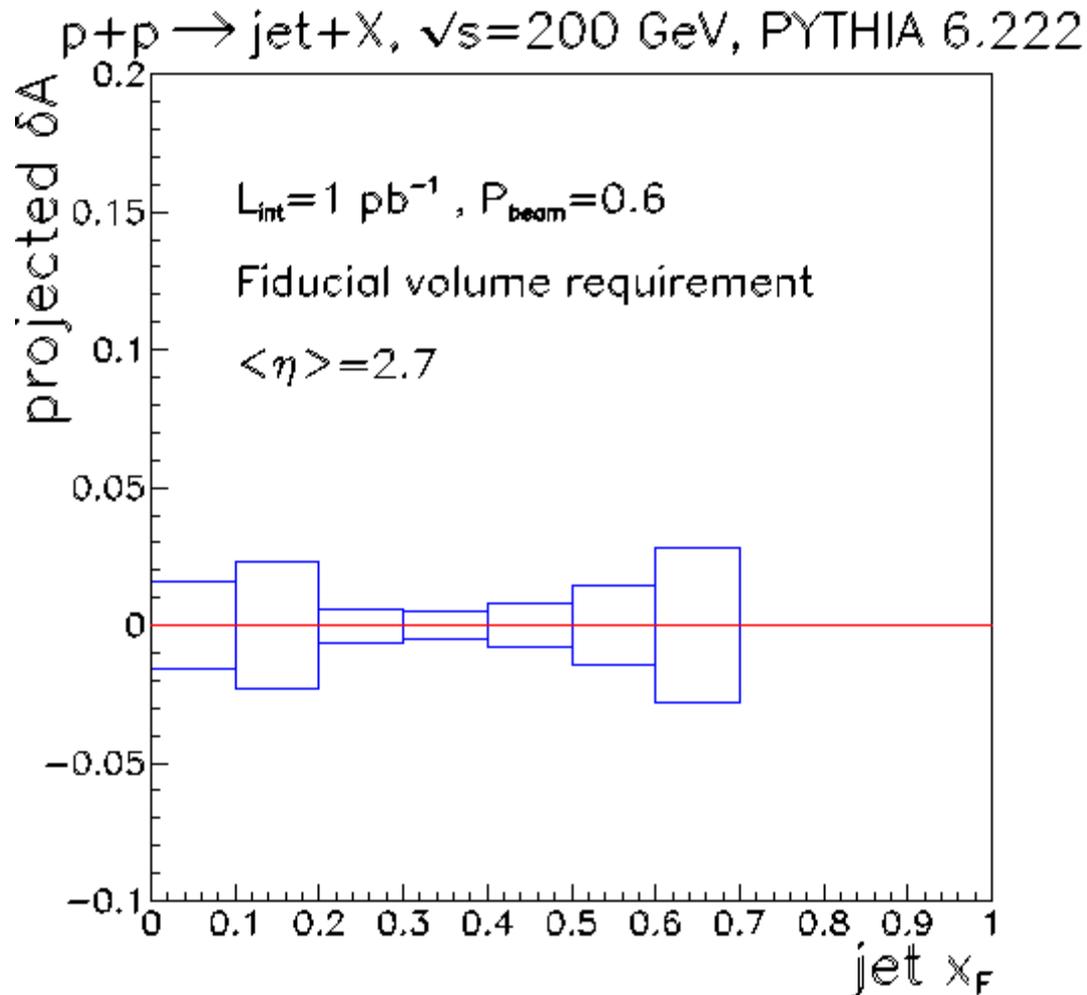

- As noted last year, jets and photons can discriminate betweeen quark-gluon correlators

- $\sqrt{s}$=500 GeV jets from run-11 A_NDY will have 2.5x larger p_T at the same x_F, relative to these predictions.

- The best way to test things is at $\sqrt{s}$=200 GeV

Non-zero jet analyzing power essentially a prerequisite before proceeding to Drell Yan

Proposal
Best test of theory with jets…

p+p → jet+X, √s=200 GeV, PYTHIA 6.222

L_{int}=1 pb^{-1} , P_{beam}=0.6

Fiducial volume requirement

$<\eta>$=2.7

projected δA

jet x_F

- We propose testing impact of IP2 collisions during ongoing √s=200 GeV operation

- If impact is small as expected from last year, then proceed to integrate 1 pb^{-1} of luminosity.

- The data sample can likely be obtained with β*=7.5m at IP2, although this is inefficient

- We propose, contingent on impact test, a 6-bunch test ramp with IP2 β* ≤3m