Trigger efficiency/Luminosity study status and plan

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- Spin PWG, 05/09/2002

Motivation

- To get physics cross section (for example, J/psi production) in p+p, we have to know efficiencies of minimum bias trigger counters (BBC/NTC/ZDC)

$$\sigma_{J/\psi} = \frac{N_{J/\psi}}{\varepsilon_{J/\psi\,event} L}$$

$$= \frac{N_{J/\psi}}{N_{mb}} \frac{\varepsilon_{mb\_event}}{\varepsilon_{J/\psi\,event}} \sigma_{mb}$$

$\varepsilon_{J/\psi event}$: trigger efficiency for J/ψ events

ε_{mb_event}: trigger efficiency for minimum bias events

σ_{mb}: cross section for pp minimum bias events

ε_{mb_event} preliminary results using PYTHIA

trigger	efficiency
NTCw	0.63
BBLL1(>=1)	0.51
NTCw || BBLL1(>=1)	0.74

Assumptions / conditions

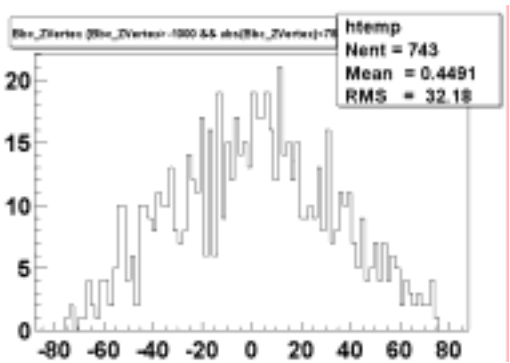
- 42mb total cross section (inelastic + diffractive)
- Bunch z-vertex distribution RMS = 50cm
- NTCw vertex cut is 120cm
- NTCw vertex resolution is 45cm
- BBLL1 vertex cut is 75cm
- BBC calibration parameters were obtained with Au+Au data
- Full simulation for BBC but PISA simulation only for NTC

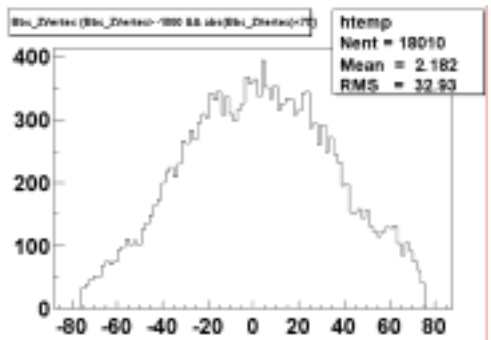
PYTHIA real-data comparison

PYTHIA

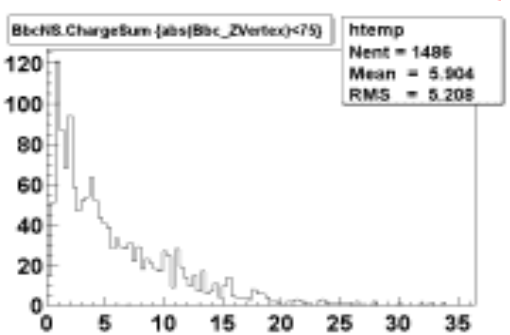
Run 40211-0000

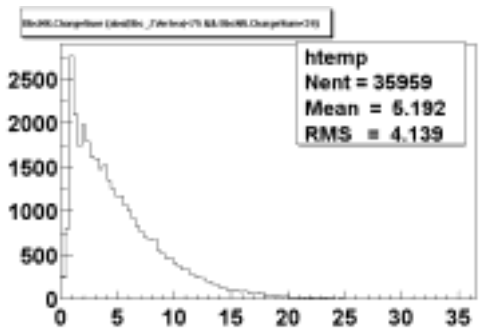
Z-vertex



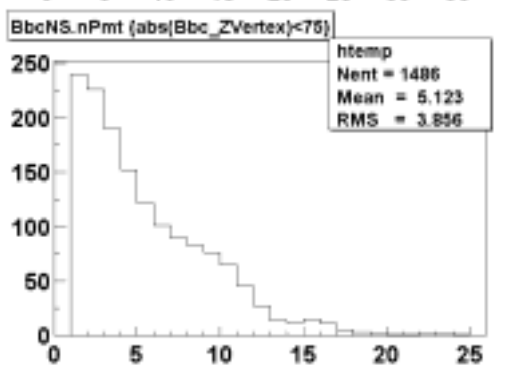


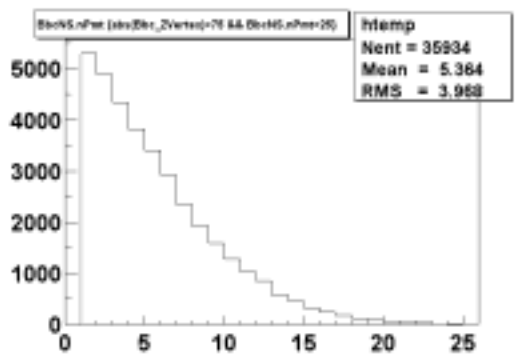
Charge Sum





Nhit PMT





Plans

- More realistic estimates on ε_{mb_event}
  - BBC calibration constants obtained in pp run
  - BBLL1 emulator
  - NTC simulation with response chain (realistic efficiencies)
- Estimate systematic uncertainties
  - BBC threshold/gain fluctuation
  - Bunch Z-vertex distribution
  - Event generator uncertainties
    - BBC charge sum/hit multiplicity
- Obtain $\varepsilon_{J/\psi event}$ (also $\varepsilon_{\pi 0(pT)event}$, ...)