

# Generator and simulation workshop shopping list from RadPen group

Jim Libby (for the AWG)

- Detector
  - $\mu$ -ID efficiency data-to-MC agreement
  - $K^+/K^-$  detector asymmetry
  - Electron tracking
  - EMC
    - Lateral moment
    - # crystals – conditions in continuum
    - Photon multiplicity
- Generators
  - Fragmentation and inclusive particle spectra
  - Semileptonic spectra (covered by Jochen Dingfelder)
  - Higher  $K^*$  resonances
  - Continuum MC to data agreement

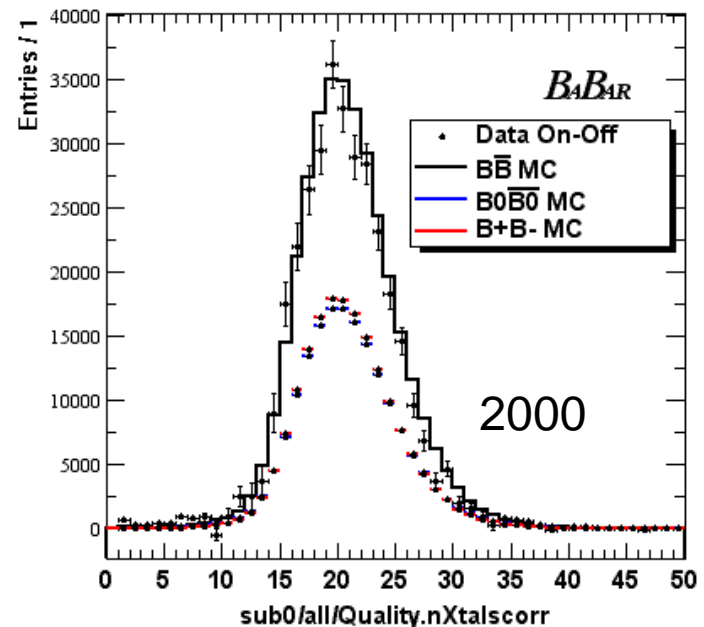
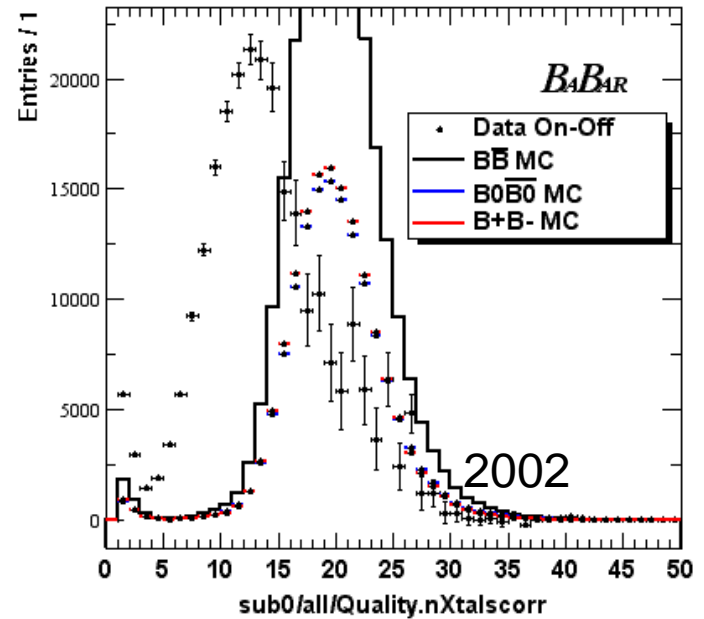
# General detector issues

- $\mu$ -ID efficiency data-to-MC agreement
  - Important for  $K^{(*)}ll$  and  $X_s ll$  analyses
  - Large PID killing factors
- $K^+/K^-$  detector interaction asymmetry
  - Largest systematic uncertainty in:
    - $A_{cp}(B \rightarrow X_s \gamma) = 0.025 \pm 0.050(\text{stat}) \pm 0.015(\text{syst})$
    - $A_{cp}(B \rightarrow K^* \gamma) = -0.013 \pm 0.036(\text{stat}) \pm 0.010(\text{syst})$
  - Low momentum material interactions in GEANT
  - Tracking and PID

# EMC issues

- # crystals
  - Off-resonance subtracted data to BB MC-SP4
  - Poor agreement: 2000 and 2001
- Known ADB problems:
  - conditions following for off-resonance data?

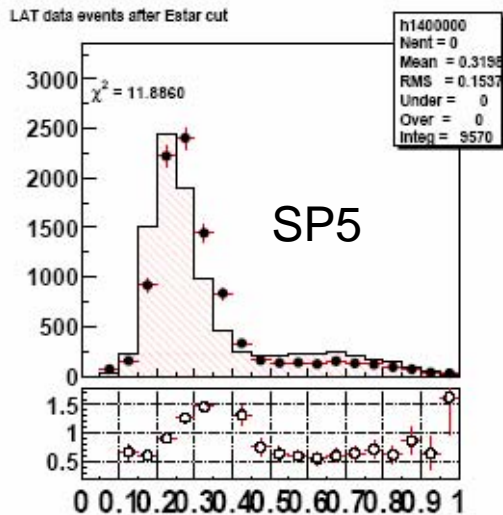
All HE  $\gamma$



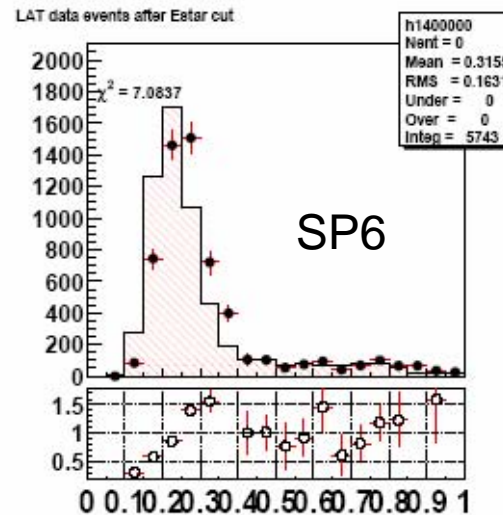
# EMC issues 2 (from H. Flaecher)

- Lateral moment distributions peak higher in data than MC
- All run periods

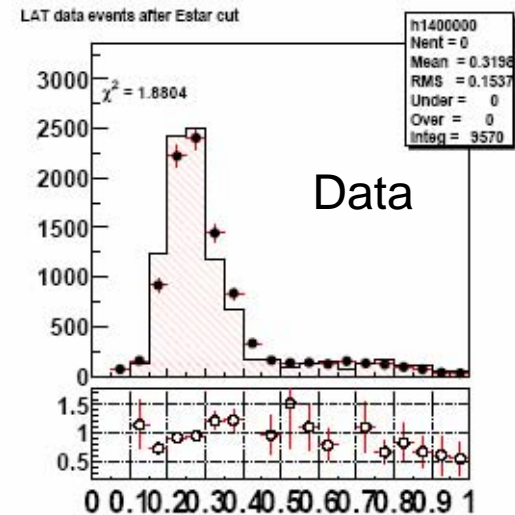
All HE  $\gamma$



Run 1-3 vs Cocktail



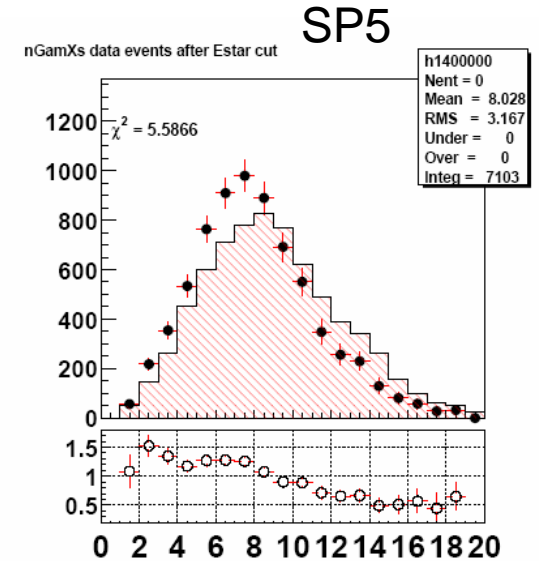
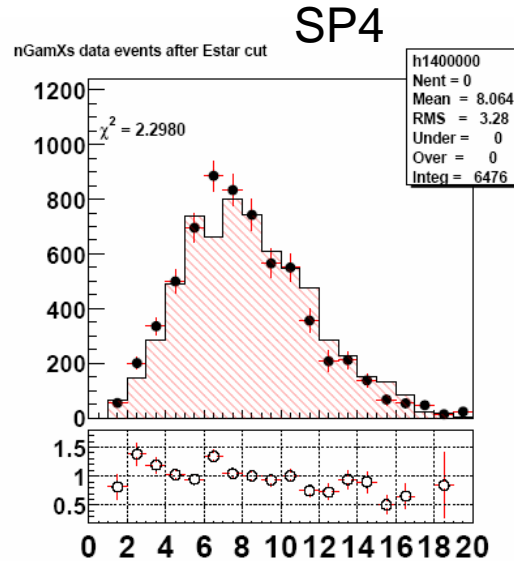
Run4 vs Generic



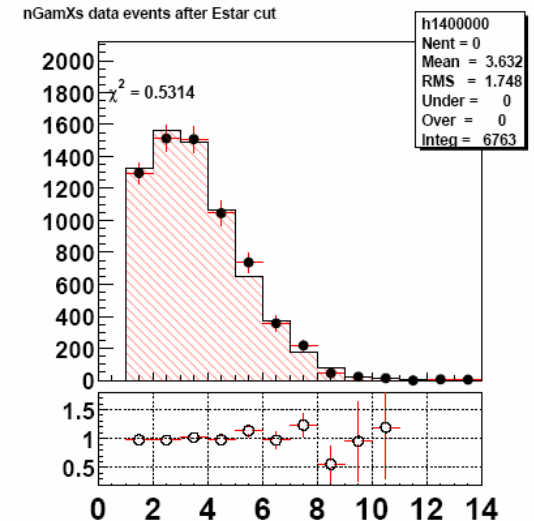
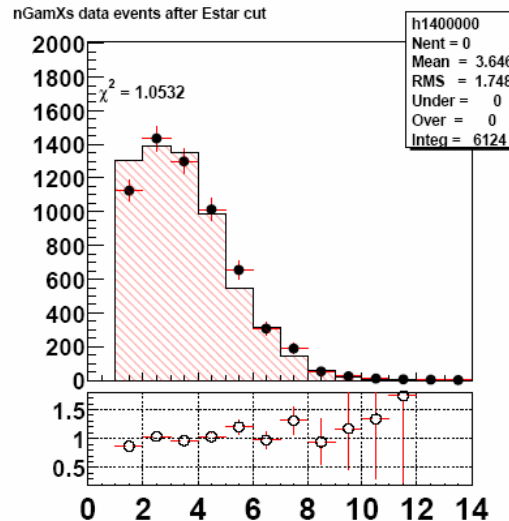
Run 1-3(points) vs Run4

# EMC or generator (H. Flaecher)

# of neutrals  
in Recoil  
(no cuts)



# of neutrals  
in Recoil  
("good photons")  
 $E > 80 \text{ MeV}$   
 $0.05 < \text{LAT} < 0.5$   
 $s9s25 > 0.9$



# Inclusive spectra and fragmentation

- Important for the inclusive analyses in the AWG:
  - BB MC modeling largest systematic in fully inclusive  $b \rightarrow s \gamma$
  - Fragmentation of Xs system in the semi-inclusive  $b \rightarrow s \gamma$  analysis dominant systematic in many hadronic mass bins
  - Also an important systematic in the sum-of-exclusive  $b \rightarrow s ll$ 
    - Things got worse from SP4 to SP5-fragmentation of S=1 Xs state changed by a factor of two

# Inclusive spectra and fragmentation

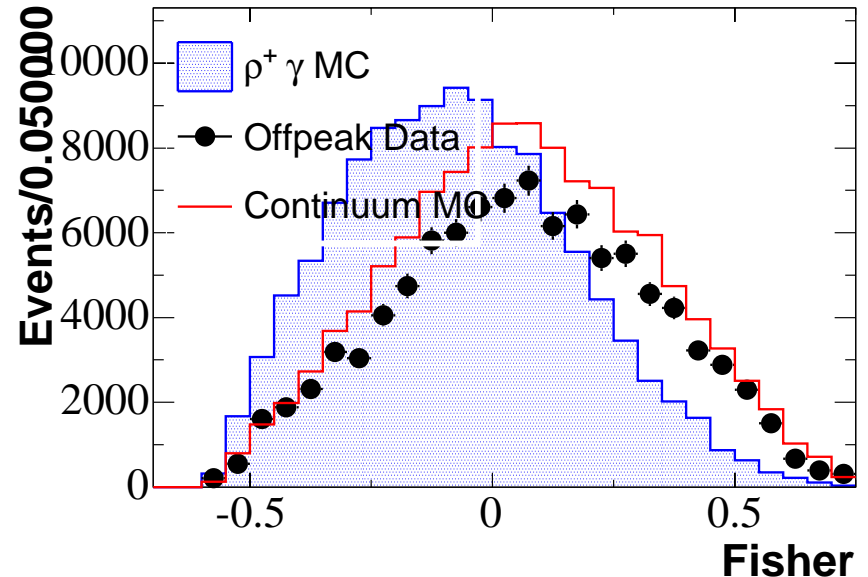
$E_\gamma^*$ (GeV)	$\alpha_{\pi^0}$	$\alpha_\eta$	$\alpha_\omega$	$\alpha_{\eta'}$	$\alpha_{n/p}$	$\alpha_{elect}$	$\alpha_{veto}$	$\alpha_{semi}$	$\alpha_{all}$
1.6 – 1.7	$1.10 \pm 0.04$	$0.79 \pm 0.12$	$0.83 \pm 0.15$	$0.91 \pm 0.35$	$0.54 \pm 0.27$	$1.09 \pm 0.12$	$1.05 \pm 0.02$	$1.08 \pm 0.07$	$1.14 \pm 0.09$
1.7 – 1.8	$1.11 \pm 0.04$	$0.75 \pm 0.12$	$0.83 \pm 0.15$	$0.81 \pm 0.34$	$0.54 \pm 0.27$	$1.12 \pm 0.12$	$1.05 \pm 0.02$	$1.09 \pm 0.07$	$1.16 \pm 0.09$
1.8 – 1.9	$1.12 \pm 0.04$	$0.70 \pm 0.15$	$0.83 \pm 0.15$	$0.78 \pm 0.33$	$0.54 \pm 0.27$	$1.15 \pm 0.15$	$1.05 \pm 0.02$	$1.09 \pm 0.07$	$1.17 \pm 0.09$
1.9 – 2.0	$1.11 \pm 0.05$	$0.72 \pm 0.15$	$0.83 \pm 0.15$	$0.92 \pm 0.52$	$0.54 \pm 0.27$	$1.23 \pm 0.19$	$1.05 \pm 0.02$	$1.11 \pm 0.07$	$1.18 \pm 0.10$
2.0 – 2.1	$1.09 \pm 0.06$	$0.80 \pm 0.21$	$0.83 \pm 0.15$	$1.64 \pm 0.65$	$0.54 \pm 0.27$	$1.31 \pm 0.28$	$1.05 \pm 0.02$	$1.07 \pm 0.07$	$1.16 \pm 0.10$
2.1 – 2.2	$1.08 \pm 0.07$	$0.90 \pm 0.21$	$0.83 \pm 0.15$	$1.77 \pm 1.38$	$0.54 \pm 0.27$	$1.39 \pm 0.54$	$1.05 \pm 0.02$	$1.07 \pm 0.07$	$1.16 \pm 0.11$
2.2 – 2.3	$0.99 \pm 0.10$	$0.95 \pm 0.28$	$0.83 \pm 0.15$	$1.77 \pm 1.86$	$0.54 \pm 0.27$	$1.39 \pm 0.99$	$1.05 \pm 0.02$	$1.11 \pm 0.07$	$1.12 \pm 0.13$
2.3 – 2.4	$0.75 \pm 0.17$	$0.96 \pm 0.30$	$0.83 \pm 0.15$	$1.77 \pm 1.11$	$0.54 \pm 0.27$	$1.13 \pm 0.57$	$1.03 \pm 0.01$	$1.09 \pm 0.07$	$0.92 \pm 0.15$
2.4 – 2.5	$0.43 \pm 0.25$	$0.97 \pm 0.35$	$0.83 \pm 0.15$	$1.77 \pm 1.11$	$0.54 \pm 0.27$	$1.13 \pm 0.57$	$1.03 \pm 0.01$	$1.05 \pm 0.07$	$0.74 \pm 0.19$
2.5 – 2.6	$0.38 \pm 0.26$	$1.00 \pm 0.63$	$0.83 \pm 0.15$	$1.77 \pm 1.05$	$0.54 \pm 0.27$	$1.13 \pm 0.57$	$1.03 \pm 0.01$	$1.09 \pm 0.07$	$0.65 \pm 0.22$
2.6 – 2.7	$0.45 \pm 0.40$	$1.00 \pm 0.90$	$0.83 \pm 0.15$	$1.77 \pm 1.86$	$0.54 \pm 0.27$	$1.13 \pm 0.57$	$1.03 \pm 0.01$	$1.01 \pm 0.07$	$0.68 \pm 0.29$
2.7 – 2.8	$0.35 \pm 0.62$	$1.00 \pm 0.90$	$0.83 \pm 0.15$	$1.77 \pm 1.86$	$0.54 \pm 0.27$	$1.13 \pm 0.57$	$1.03 \pm 0.01$	$1.14 \pm 0.07$	$0.66 \pm 0.30$

Corrections to BB background MC in  $b \rightarrow s\gamma$  fully inclusive analysis by component

# Other generator issues

- Continuum MC-normalization

From the  
Run1-4  $\rho \gamma$  analysis  
Fisher of B and helicity angle



- Full model of higher  $K^*$  resonances (A. Samuel and F. Porter, CALTECH) are working to have these in SP7-deadline?