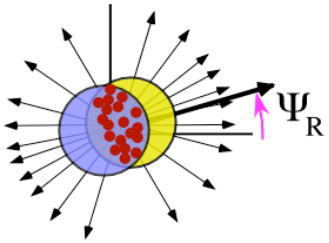
Reaction Plane and Flow Measurements at BRAHMS

In Copenhagen FLOW looked promising with the current BRAHMS multiplicity arrangement….

…now that we meet in Krakow, our optimism is somewhat tempered.

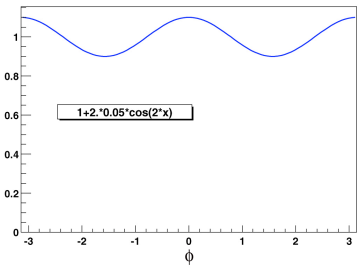
But only slightly.



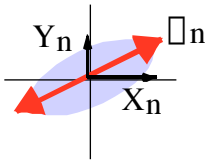
Basics

Ref.: A.M Poskanzer and S.A. Voloshin, Phys. Rev. C 58, 1671((1998)

$$\frac{dN}{d(\phi-\Psi_R)} = N_o\left(1+2V_1\cos(\phi-\Psi_R)+2V_2\cos\left(2(\phi-\Psi_R)\right)+\cdots\right)$$



Event Plane Reconstruction:



$\Psi_n=\tan^{-1}(X_n/Y_n)/n$

$(X_n,Y_n)=(\sum w\cos(n\phi),\sum w\sin(n\phi))$

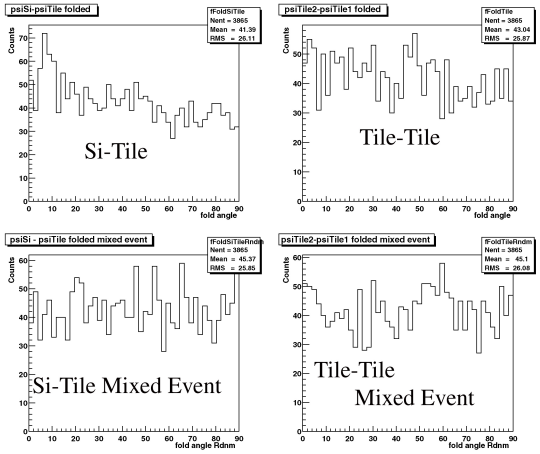
Data Used in Analysis for Copenhagen Meeting

First 61 sequences of run 2336 (130 GeV Au+Au)
20-40% Centrality
-29 cm ≤ Z_{vertex} ≤ -9 cm (center vertex at Si ring)

Event Plane Resolution (Qualitative)

Procedure:

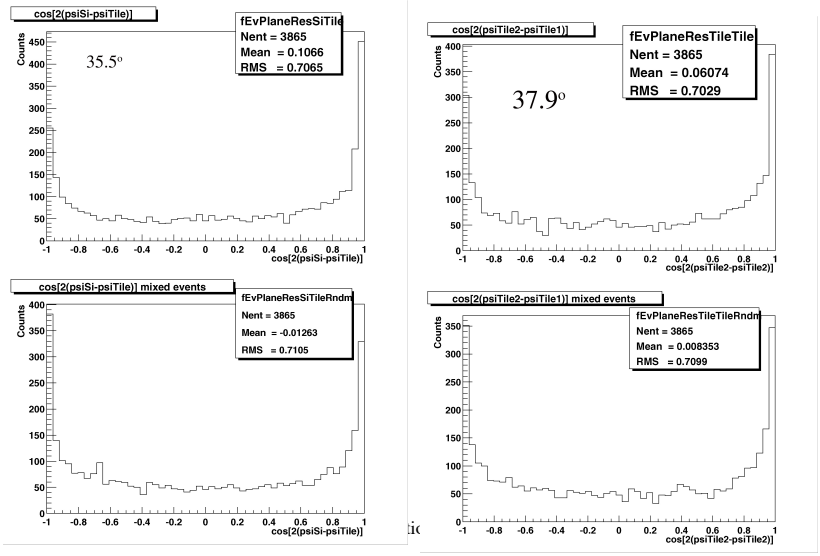
Evaluate 2 (or more) "sub-event" planes. For no flow the correlation between two random planes of the same order should be a triangular distribution. Folding $\Phi_n^a - \Phi_n^b$ about $\pi/2$ should give flat distribution



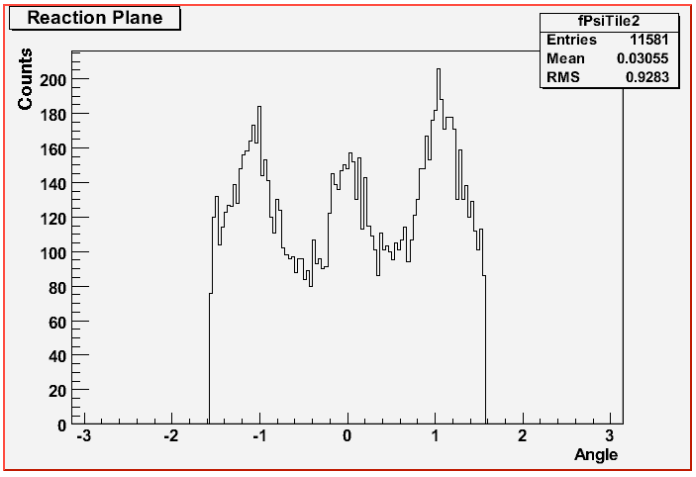
Event Plane Resolution (Quantitative)

(sort of…)

$$\left\langle \cos n\left(\Psi_n^{a,b} - \Psi_R\right)\right\rangle = \left\langle \cos n\left(\Psi_n^{a} - \Psi_n^{b}\right)\right\rangle^{1/2}$$



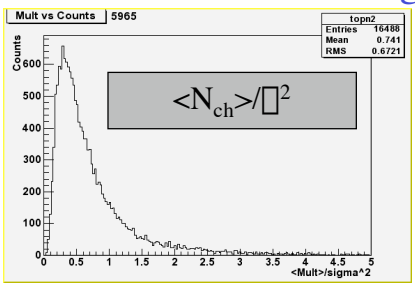
Problem found with closer inspection…

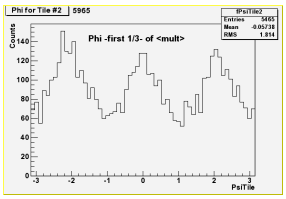


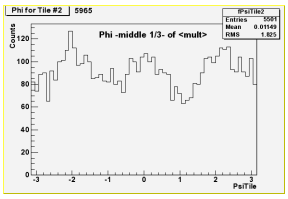
..this should be flat!!!

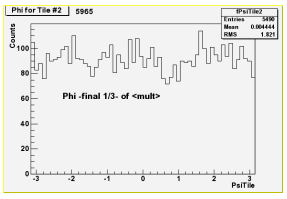
Characterization in terms of "anomalous" energy deposition…

Data:



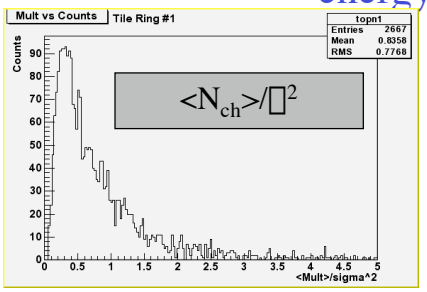


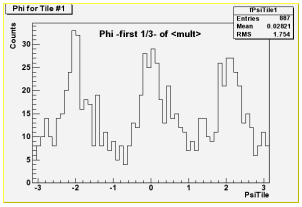


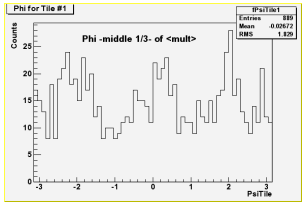


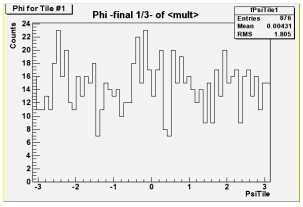
Characterization in terms of "anomalous" energy deposition…

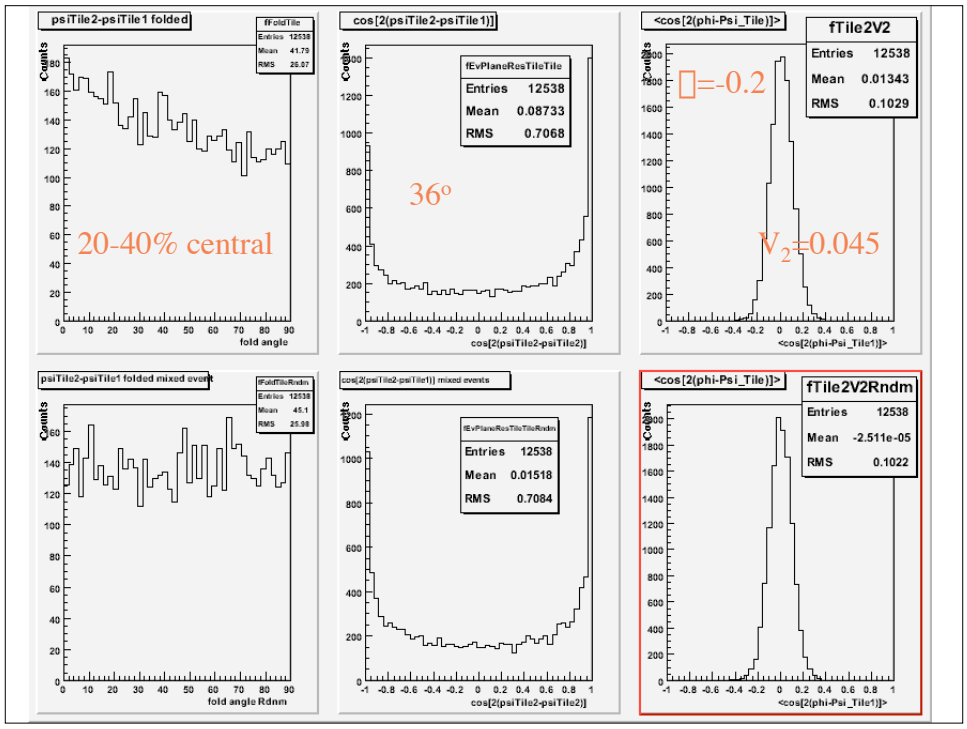
GEANT Simulation:

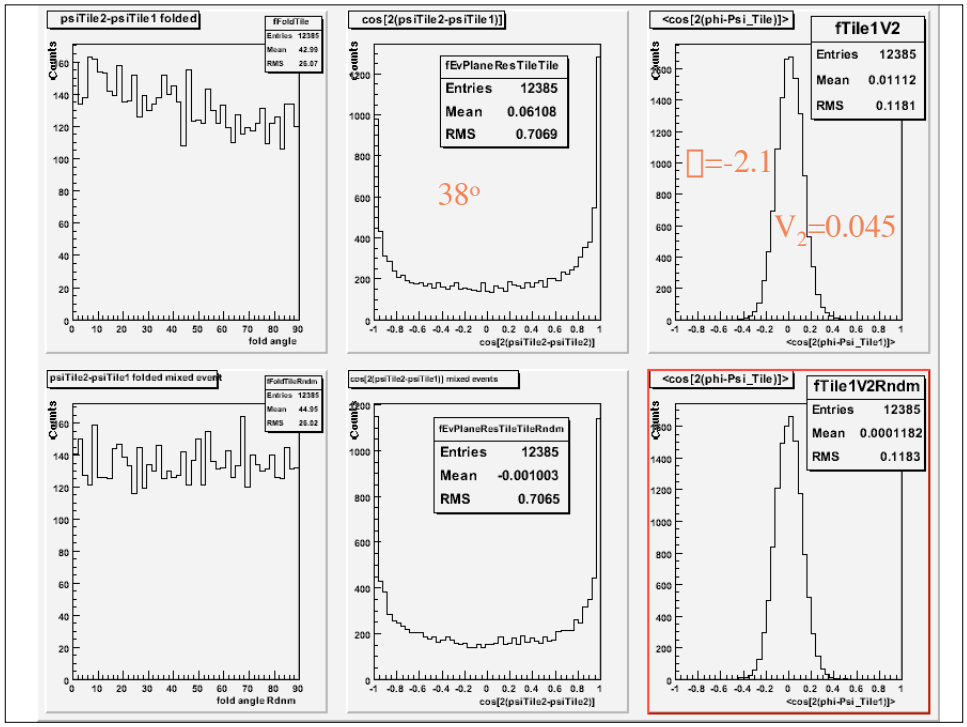




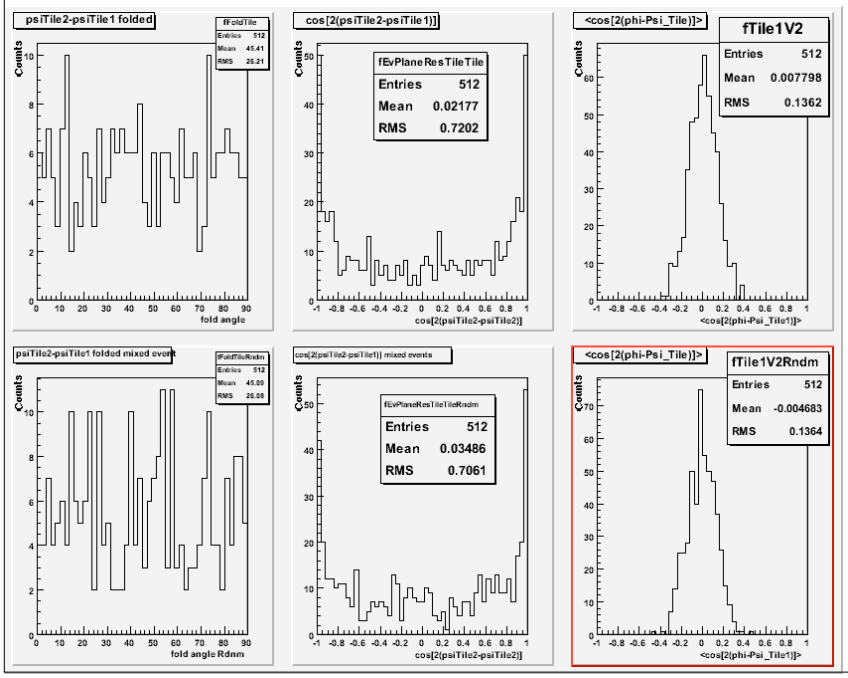





psiTile2-psiTile1 folded
fFoldTile
Entries 12538
Mean 41.79
RMS 26.07
Counts
fold angle
20-40% central
cos[2(psiTile2-psiTile1)]
fEvPlaneResTileTile
Entries 12538
Mean 0.08733
RMS 0.7068
36º
cos[2(psiTile2-psiTile2)]
<cos[2(phi-Psi_Tile)]>
fTile2V2
Entries 12538
Mean 0.01343
RMS 0.1029
=-0.2
V2=0.045
<cos[2(phi-Psi_Tile1)]>
psiTile2-psiTile1 folded mixed event
fFoldTileRndm
Entries 12538
Mean 45.1
RMS 25.98
fold angle Rdnm
cos[2(psiTile2-psiTile1)] mixed events
fEvPlaneResTileTileRndm
Entries 12538
Mean 0.01518
RMS 0.7084
fTile2V2Rndm
Entries 12538
Mean -2.511e-05
RMS 0.1022


psiTile2-psiTile1 folded
fFoldTile
Entries 12385
Mean 42.99
RMS 25.97
Counts
fold angle
cos[2(psiTile2-psiTile1)]
fEvPlaneResTileTile
Entries 12385
Mean 0.06108
RMS 0.7069
38º
cos[2(psiTile2-psiTile2)]
<cos[2(phi-Psi_Tile)]>
fTile1V2
Entries 12385
Mean 0.01112
RMS 0.1181
=-2.1
V2=0.045
<cos[2(phi-Psi_Tile1)]>
psiTile2-psiTile1 folded mixed event
fFoldTileRndm
Entries 12385
Mean 44.95
RMS 26.02
fold angle Rdnm
cos[2(psiTile2-psiTile1)] mixed events
fEvPlaneResTileTileRndm
Entries 12385
Mean -0.001003
RMS 0.7065
fTile1V2Rndm
Entries 12385
Mean 0.0001182
RMS 0.1183

What does GEANT say?…



V_2=0 (input)

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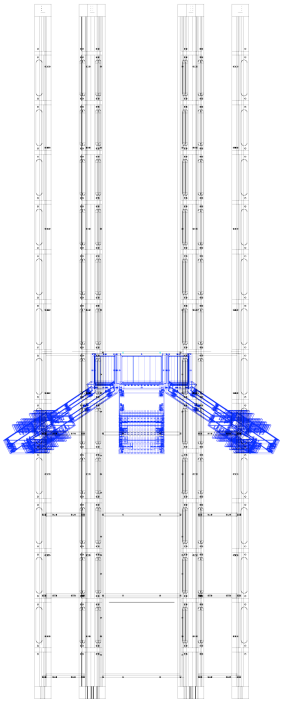
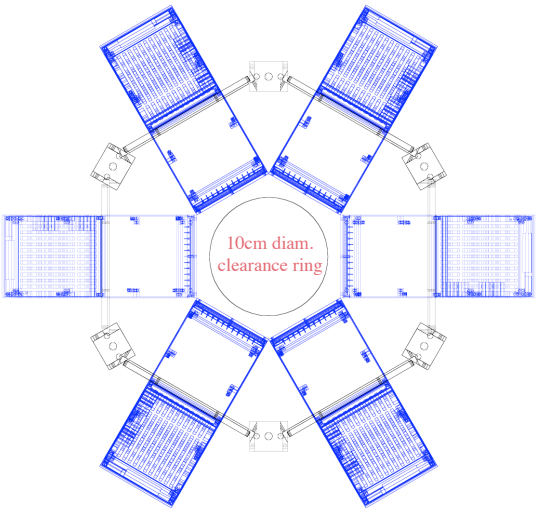
Possible reconfiguration of Si array…





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