v2 $\mathrm{J}/\psi \rightarrow \mu\mu$ analysis status

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Outline

The R_aa analysis shown on January the 10th come as a support of this analysis.

This presentation is meant to give an overview of the different steps of the analysis so that the procedure is made clear. We aim to present the results at QM but cannot ask for preliminary today because we do not have yet a complete full data set available (waiting for Condor jobs to finish).

These slides show:

- Setup and cuts
- Reaction plane
- Substraction method
- Invariant Mass Fit method
- Schedule

Outline

Setup and cuts

Reaction Plane detector

Extracting v_2 with the "substraction method"

Extracting v_2 with the "invariant mass fit method"

Schedule before QM

Good run lists

QA run selection criteria is decribe in the AN and at:
`https://www/phenix.bnl.gov/WWW/offline/wikioffline/index.php/Run7dimuon`

An updated good run list is being used:
`~lindenle/cvsworking/phenix/analysis_noCVS/run7/dimuon/run7AuAu_new_filedb_080107_south.txt`
`~lindenle/cvsworking/phenix/analysis_noCVS/run7/dimuon/run7AuAu_new_filedb_080107_north.txt`

Equivalent number of events

	BBCLL1 events	$\epsilon_{MB} \times \epsilon_{BBC_z}$	MinBias events	last week	Run4
South	$1.86\ 10^9$	0.896	$1.66\ 10^9$	$1.73\ 10^9$	$1.07\ 10^9$
North	$1.99\ 10^9$	0.896	$1.79\ 10^9$	$1.91\ 10^9$	$1.14\ 10^9$

Some additional bad runs have been removed from the good run lists since last week.

Run7 cuts [1/2]

Procedure:

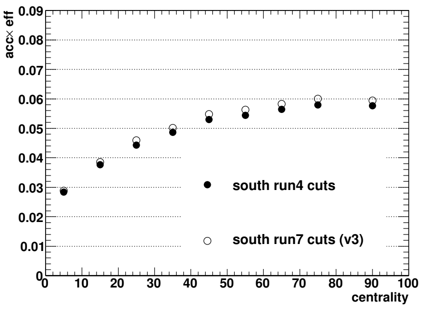
- Cuts are defined to improve remove as much background as possible without killing too much signal.
- Distributions are first compared to run 4 distributions and look similar.
- Pure J/ψ simulations reproduce well run 7 peripheral data for all distributions.
- To minimize the efficiency loss on central real data, the cut are chosen by looking at the 10% more central events of embedded J/ψ into real-data.
- Cuts are set when at least 97 % of the embedded distribution is retained.

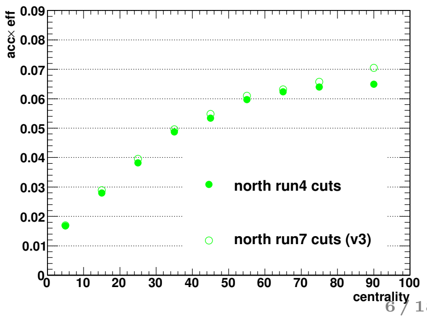
Run7 cuts [2/2]

SOUTH ARM	Run 4	Run 7
DG0	20	20
DDG0	9	9
MUTR CHI2NDF	30	23
VTX CHI2NDF	4	7

NORTH ARM	Run 4	Run 7
DG0	15	16
DDG0	9	9
MUTR CHI2NDF	30	23
VTX CHI2NDF	4	7

Differences from run 4
- tighter track χ^2: may lead to a better signal over background ratio;
- larger vertex χ^2: may be due to RxNP detector in the muon arm acceptance.





Outline

How do we use the Reaction Plane ?

Use of both RxNP for the mixing

Bias should be the same for background and like-signs so that it should cancel out. Using one arm RxNP would require to run twice the mixing which is not reasonable before QM.

Look at the 3 RxNP configurations for the measurements:

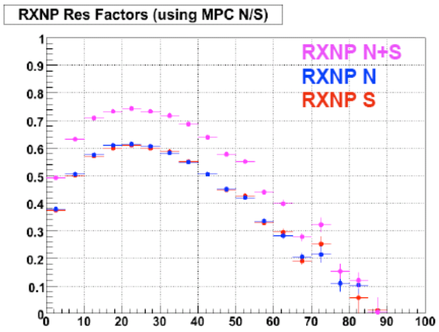
1. Using North+South RxNP: might be biased because of the 2 muons and accompanying soft gluons;
2. Using the RxNP from the arm opposite to the J/ψ: no bias but poorer resolution;
3. Using the RxNP from the same arm as the J/ψ: maximum bias, poor resolution.

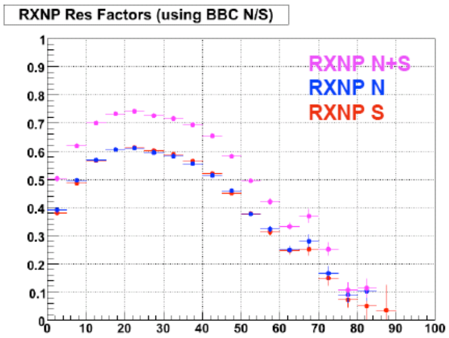
Calculations:

- of the RP resolution with CWG min bias files in (cent, zvtx) bins;
- weight with the J/ψ distribution corrected by acc$\times$eff (J/ψ invariant yield).

See Matt Wysocki's slides posted on phenix-p on the subject.

Resolution of the Reaction Plane

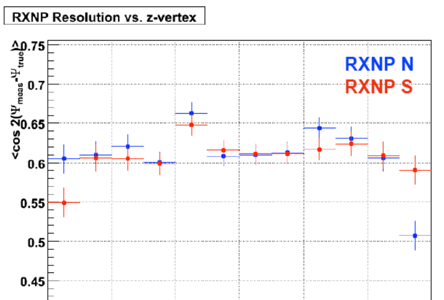




RXNP resolution obtained using North-only, South-only, North+South both, and MPC (left) or BBC (right) as references.

Results agree well.

Resolution of the Reaction Plane vs. z-vertex



RXNP resolution using just one side as a function of z-vertex.

No serious effects seen so that we might use an average value for QM.

Outline

The substraction method [1/2]

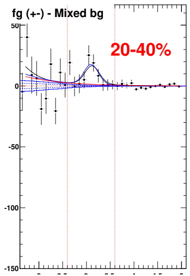
Aim

- Fit mass spectra within 20% centrality bins, 1 GeV in pt, and 4 to 6 bins in ϕ-ψ within [0,pi/2].
- Account for the fact that acceptance$\times$efficiency is not flat in 20% centrality bins with systematics.
- Look at the v_2 using each RxNP configuration (same arm, opposite arm, both arms)

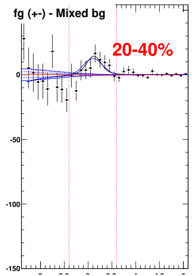
The substraction method [2/2]

Exemple of mass fits and resulting v_2^{obs} for south arm

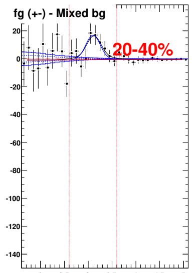
$\phi - \psi$ [-60,0] deg

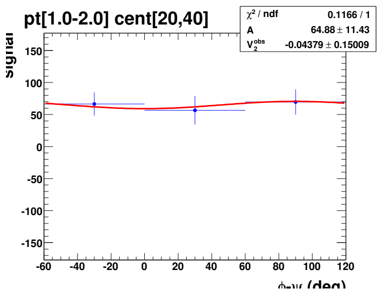


$\phi - \psi$ [0,60] deg



$\phi - \psi$ [60,120] deg





Outline

The invariant mass fit method [1/2]

Steps

- Fit the background substracted (using event mixing) unlike-sign mass spectrum (integrated over $\phi - \psi$) to get the J/ψ signal S(M) as a function of the mass.
- Use the mixed unlike-sign mass spectrum to get the background B(M).
- Fit the unlike-sign dimuon $\langle cos2\phi \rangle$ vs. mass using:

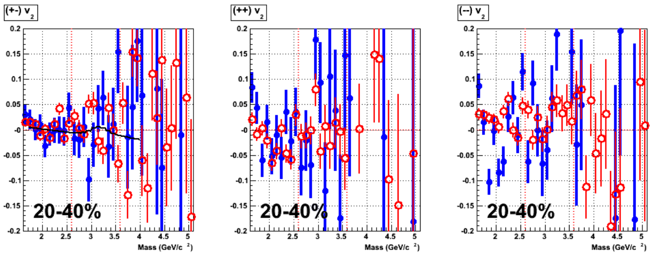
$$v_2|_{\mathrm{FG}}(M) = SF(M) \times v_2|_{\mathrm{J}/\psi} + (1 - SF(M)) \times v_2|_{\mathrm{BG}}(M)$$

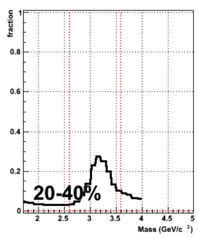
with $SF = S/(S + B)$
and a linear form for $v_2|_{\mathrm{BG}}(M)$.

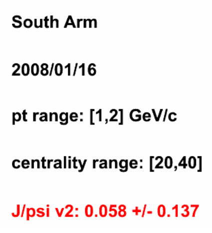
Fit parameters are $v_2|_{\mathrm{J}/\psi}$ and $v_2|_{\mathrm{BG}}(M)$.

The invariant mass fit method [2/2]

Exemple of plots







Bottom left plot: $SF(M) = S/(S+B)$ from fit of mass ditributions
Top plots: $\langle cos2\phi \rangle$ vs. mass for (++-), (++) and (–) pairs;
blue: same events
red: mixed events (unused so far)

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Analysis note is in progress in CVS:
`offline/analysis/run7_jpsi_muon/note/run7_jpsi_muon_note.ps`

All the machinary is ready, and being tested but with too low statistics to have valuable results.

We are hoping to get the statistics and checks done for early next week (depending on when the jobs end).