# Status of the analysis using the Forward Vertex Detector at PHENIX

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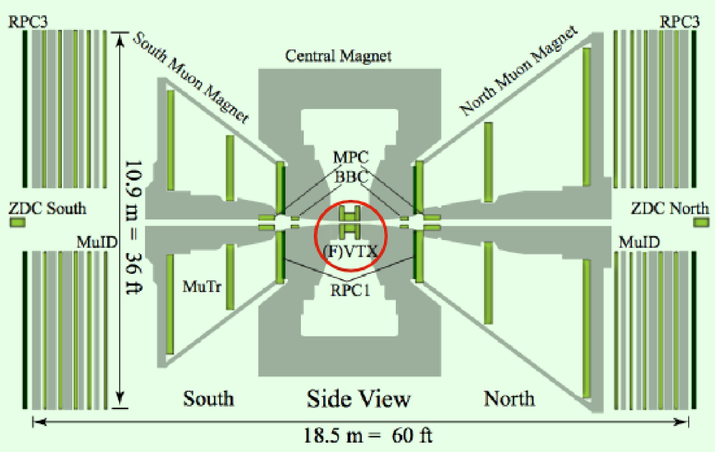
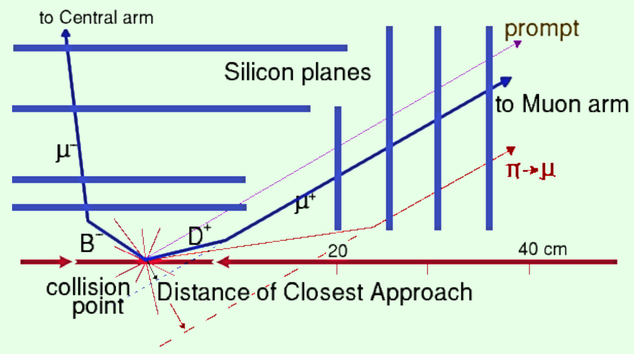
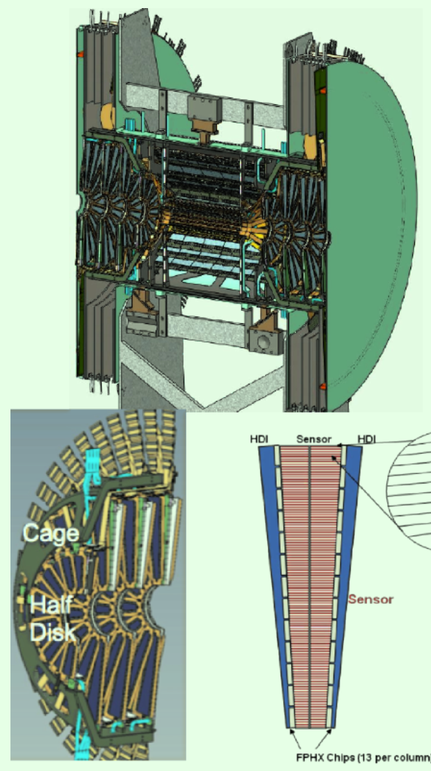
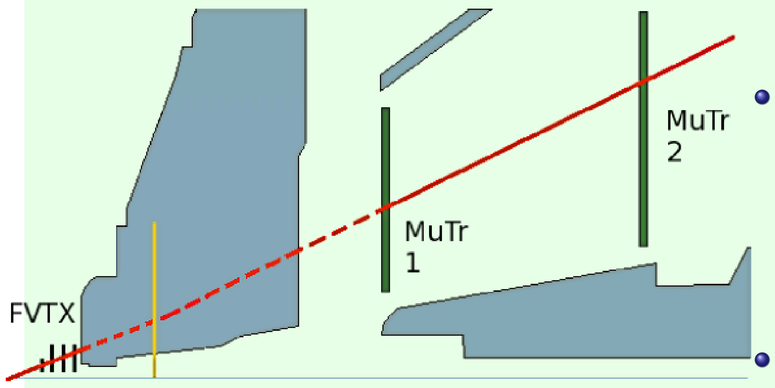
## Forward Vertex Detector




- full azimuthal coverage, $1.2 < |\eta| < 2.4$
- 4 stations in each arm placed between collision point and hadron absorbers (no magnetic field)
- 96 $\phi$ columns of strips with $\Delta r$ segmentation of 75 $\mu$m
- more details in Matt Durham's poster




- measure precise distance of the closest approach projected onto $\mu$ $p_T$ ($DCA_R$)
  - discrimination btw.
    - $\pi/K \rightarrow \mu$
    - $D/B \rightarrow \mu$
  - prompt muon identification for
    - quarkonia
    - $W \rightarrow \mu + \nu$
    - Drell-Yan
- high segmentation allows also determination of
  - centrality
  - reaction plane

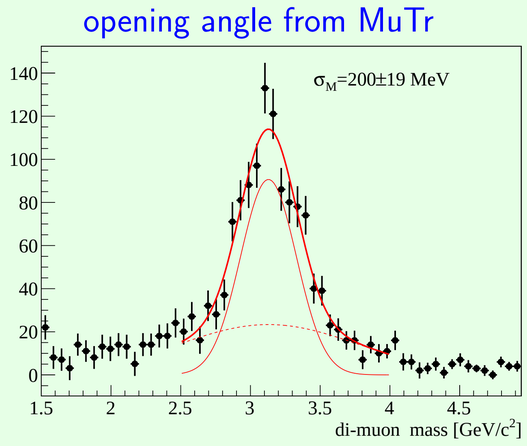
## Data acquired in 2012 engineering Run and physics tasks

- **510 GeV $p$+$p$ events:** 3.3 billion events
  - alignment studies
  - remove hadronic background in $W$ analysis
  - heavy flavor, quarkonia and Drell-Yan
- **200 GeV U+U:** few million events
  - high occupancy studies
  - centrality, reaction plane determination
- **200 GeV Cu+Au:** 9 billion events
  - heavy flavor, quarkonia and Drell-Yan $R_{CP}$ in Cu-going and Au-going direction
  - azimuthal anisotropy using FVTX reaction plane determination
- **cosmic data and field-off run**
  - high level alignment studies

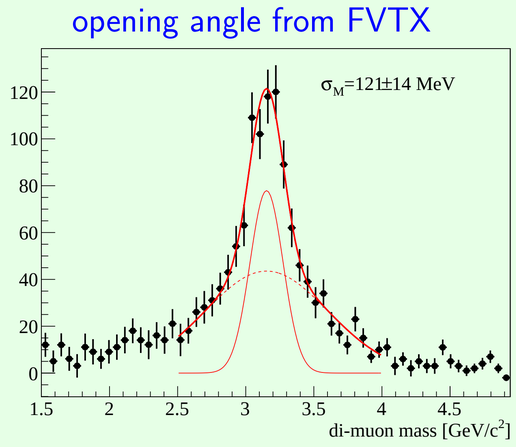
## Improvement in di-muon mass resolution

- di-muon mass distribution in $J/\psi$ region from 510 GeV $p$+$p$ in north arm ($1.2 < y < 2.2$) data sample

opening angle from MuTr




opening angle from FVTX

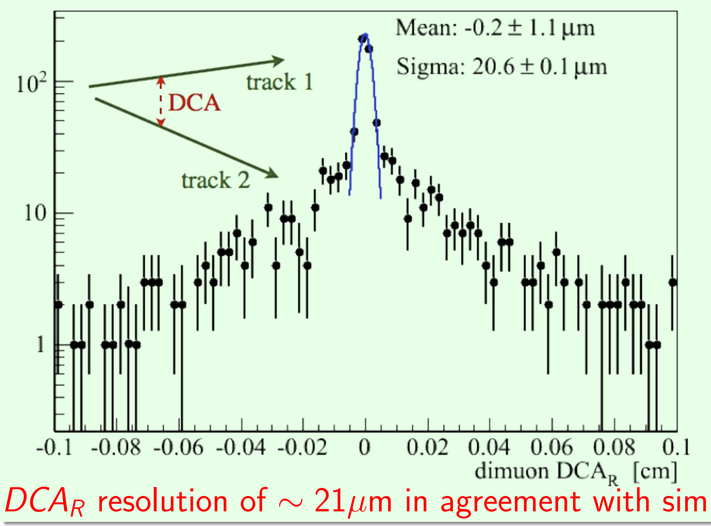


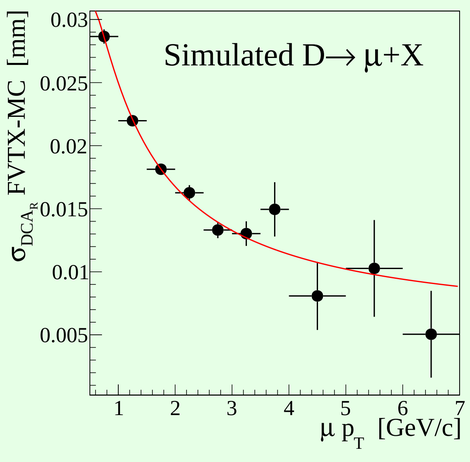

- di-muon opening angle measured by FVTX is not affected by multiple scattering in hadron absorber

## Measuring $DCA_R$ resolution with $J/\psi$ di-muon decays

all di-muon decays from $J/\psi$ should have $DCA = 0\pm$ detector resolution

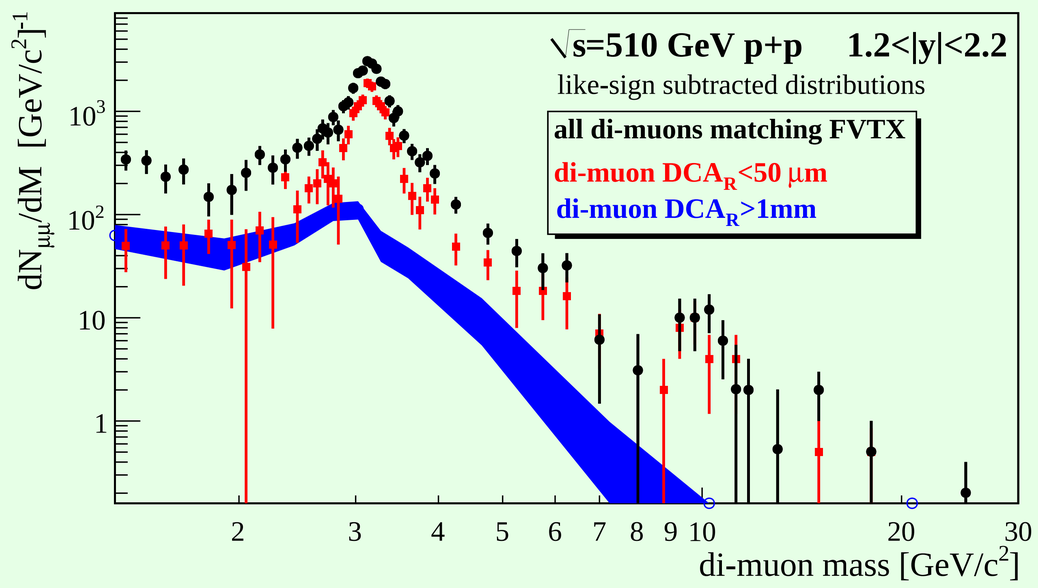
Real data 510GeV $p$+$p$




$DCA_R$ resolution of $\sim 21\mu$m in agreement with simulation

## Selecting di-muon sources with dimuon $DCA_R$ measurement



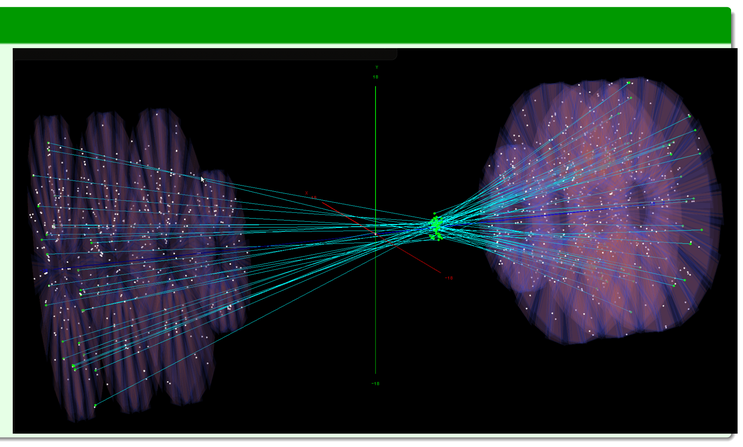

$DCA_R < 50\ \mu$m : muon pair come from same vertex (resonances, Drell-Yan)

$DCA_R > 1$ mm : dominated by correlated muon pairs with two vertices ($c\bar{c}$, $b\bar{b}$, jets)

## Primary Vertex Determination

U+U event

- primary vertex defined as the point where more tracks share the same crossing (withing DCA resolution)
- method under development



## Strategy to count $D$ and $B$ meson decays from single $\mu$ $DCA_R$ distribution

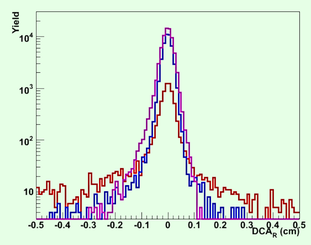
**Components to be fit to total $DCA_R$ distribution**

$J/\psi$ decays: prompt $\mu + B \rightarrow J/\psi \rightarrow \mu$

hadrons identified in MuID:

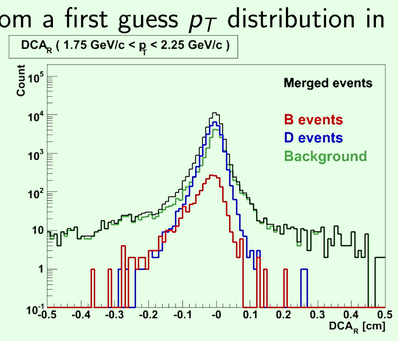
prompt hadron contamination

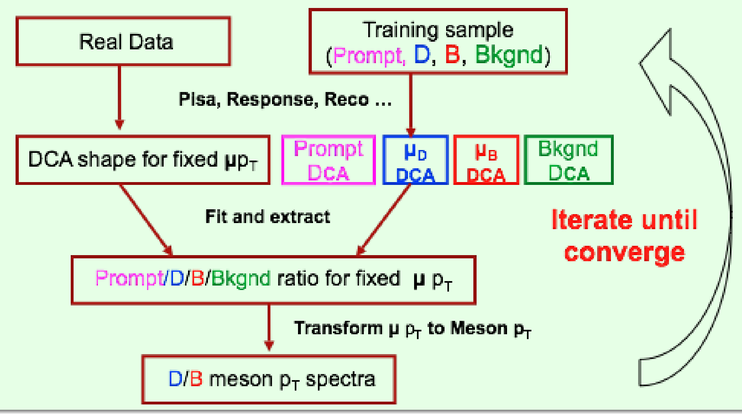
hadron decay to $\mu$



Background = hadrons

$D$ and $B$ from a first guess $p_T$ distribution in simulation

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