Transverse Dynamics at RHIC
Brookhaven, March 6–8, 2003

Differential elliptic flow at various centralities: $v_2(p_t, b)$

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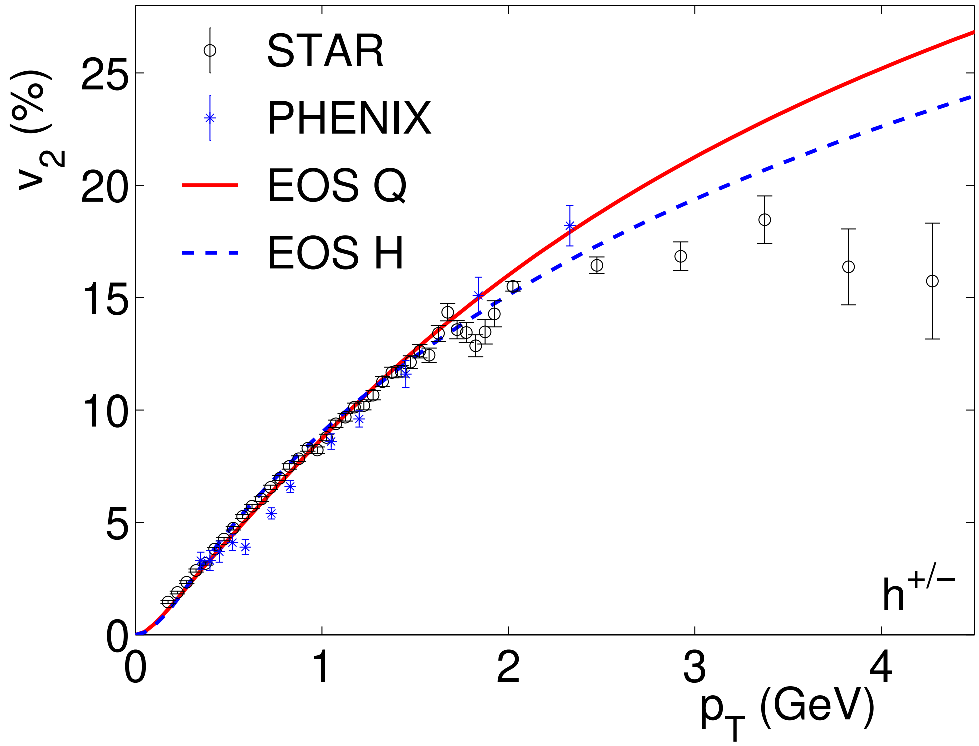
$v_2(p_T)$ in minimum bias collisions

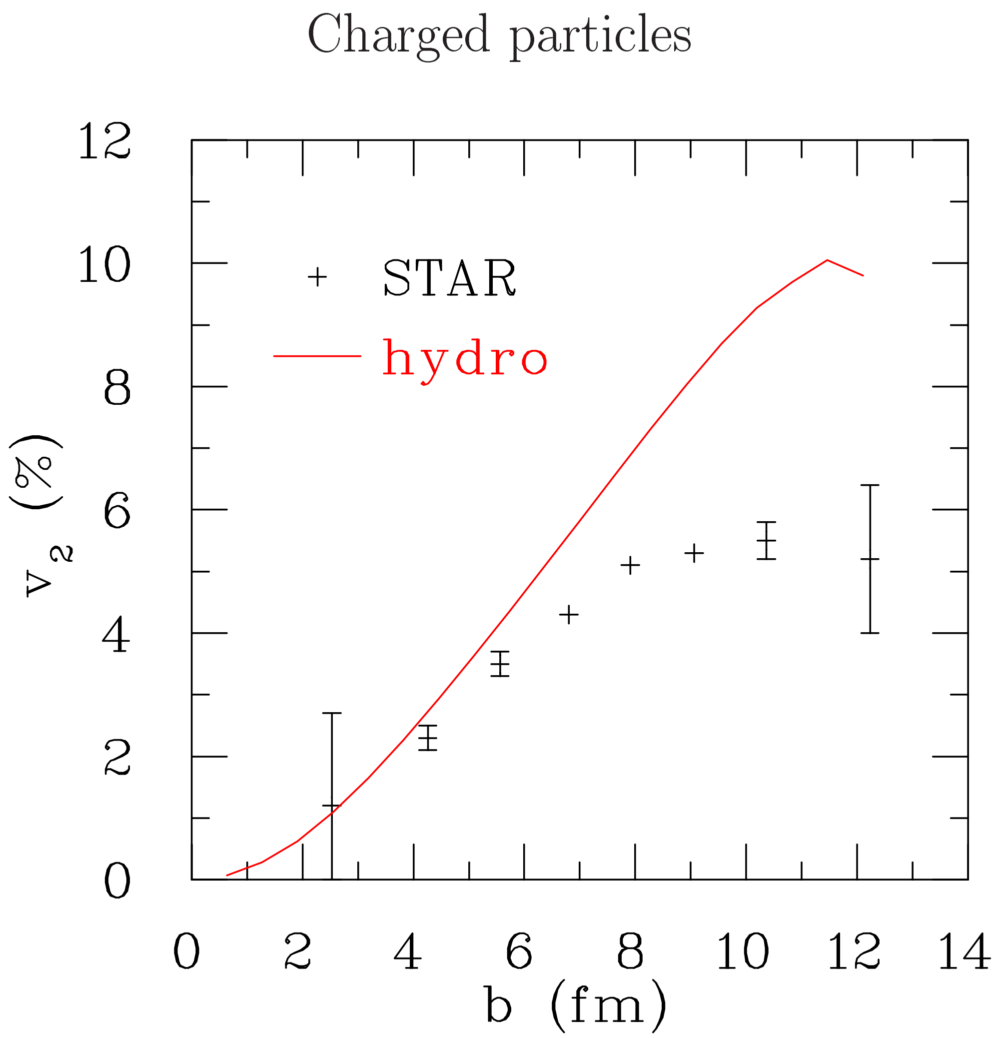
Heinz and Kolb: hep-ph/0204061

Charged hadrons:



- data reproduced at low p_T, deviates above 1.5–2 GeV/c

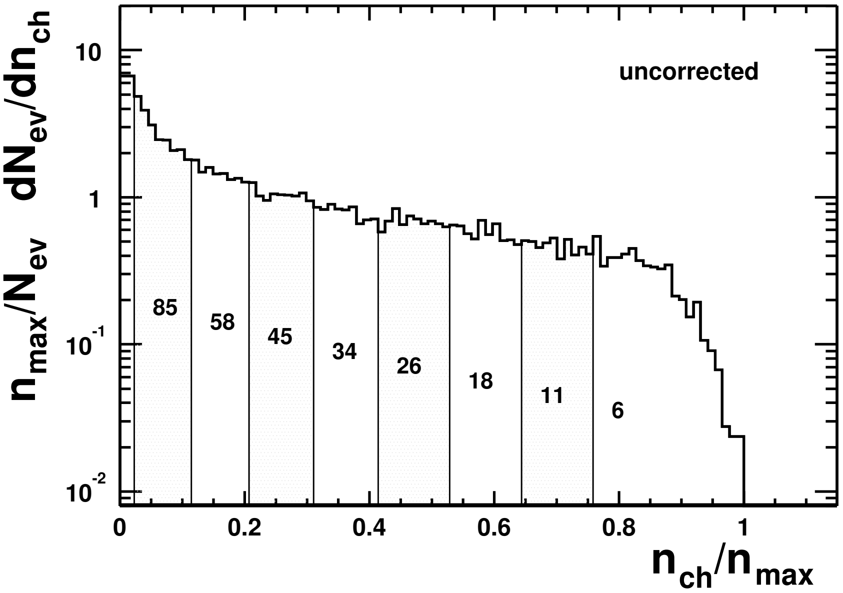
Elliptic anisotropy v_2 as function of centrality



STAR data using 4-th order cumulant method;
Phys. Rev. C **66**, 034904 (2002)

Centrality selection

STAR centrality cuts:



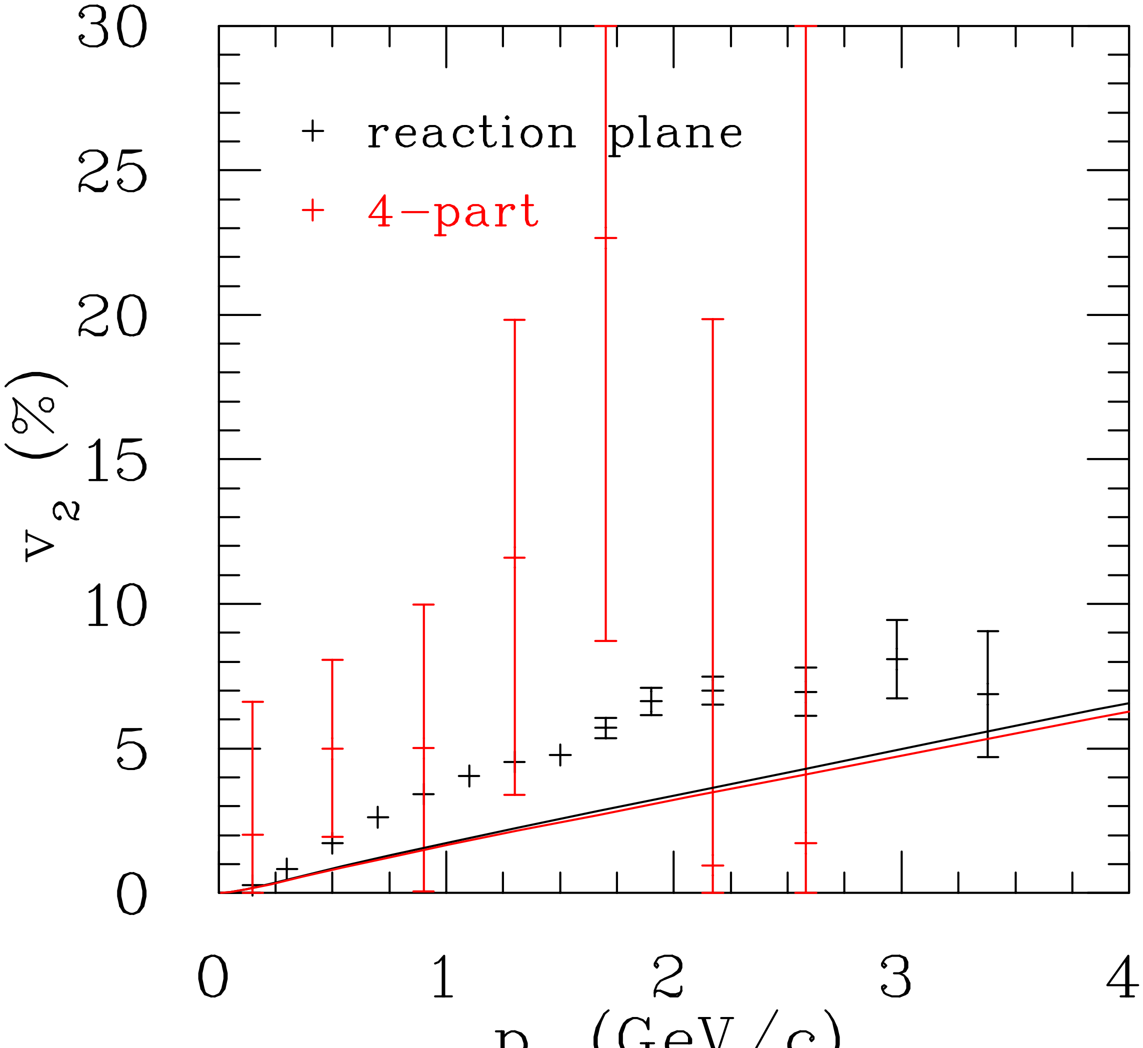
- Multiplicity at fixed b fluctuates $\rightarrow$ contributions from wide range of b in each bin.
- In hydro no fluctuations.
- Assume thermal fluctuations: $\langle \Delta N^2 \rangle = N$:

$$\mathcal{N}_{\text{events}}(N_{\text{ch}}, b)\, dN_{\text{ch}}\, db$$
$$\propto \frac{d\sigma}{db} \frac{1}{\sqrt{2\pi \langle N(b) \rangle}} \exp\left(-\frac{(\langle N(b) \rangle - N_{\text{ch}})^2}{2\langle N \rangle} \right) dN_{\text{ch}}\, db$$

- Cross section either from black disc ($R_{\text{max}} = 14.7$ fm) or optical Glauber (difference negligible)

Charged hadrons, $v_2(p_t)$

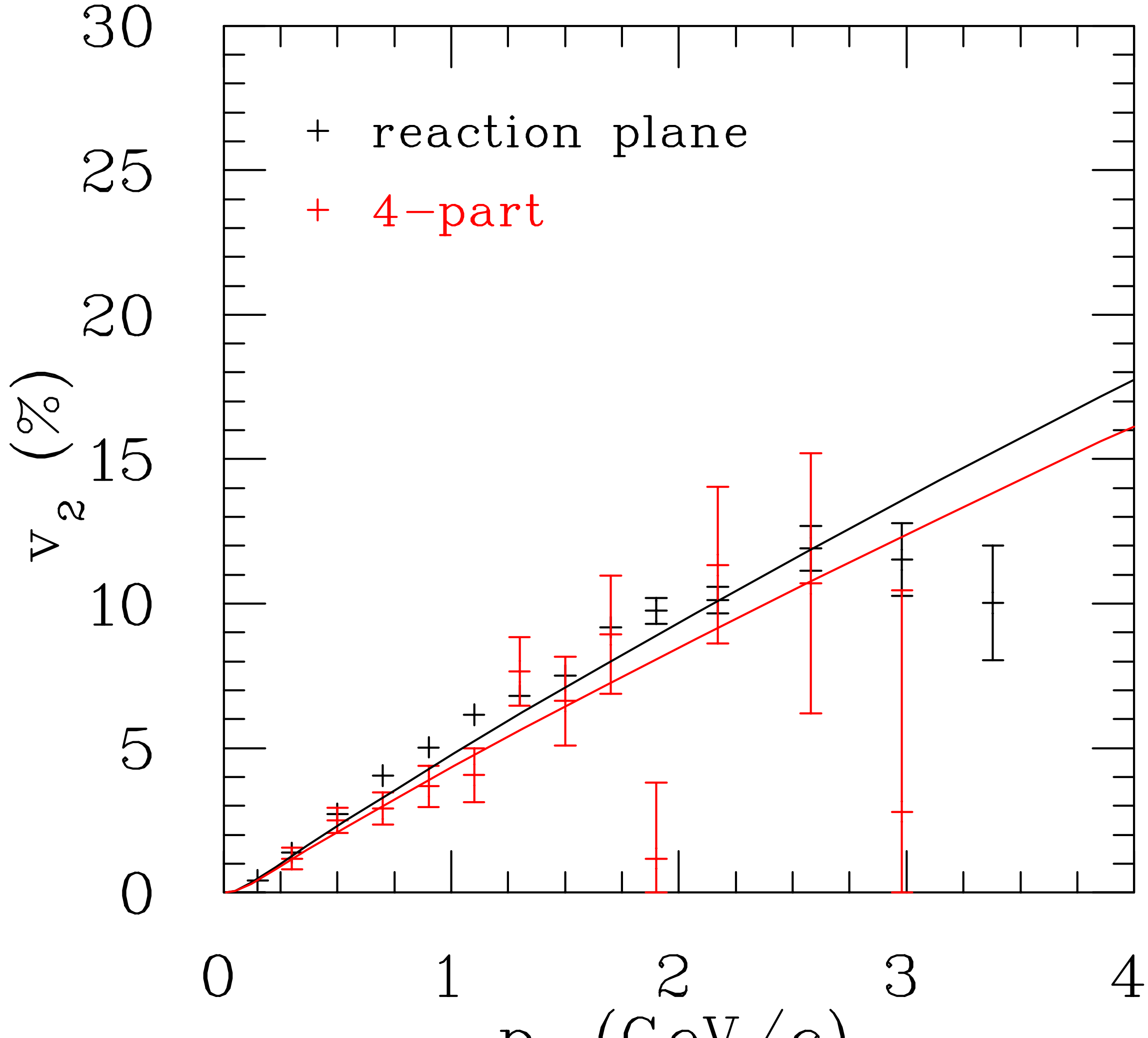
0%–5% centrality, $0 < b < 3.3$ fm



Data: STAR, Phys. Rev. C **66**, 034904 (2002)

Charged hadrons, $v_2(p_t)$

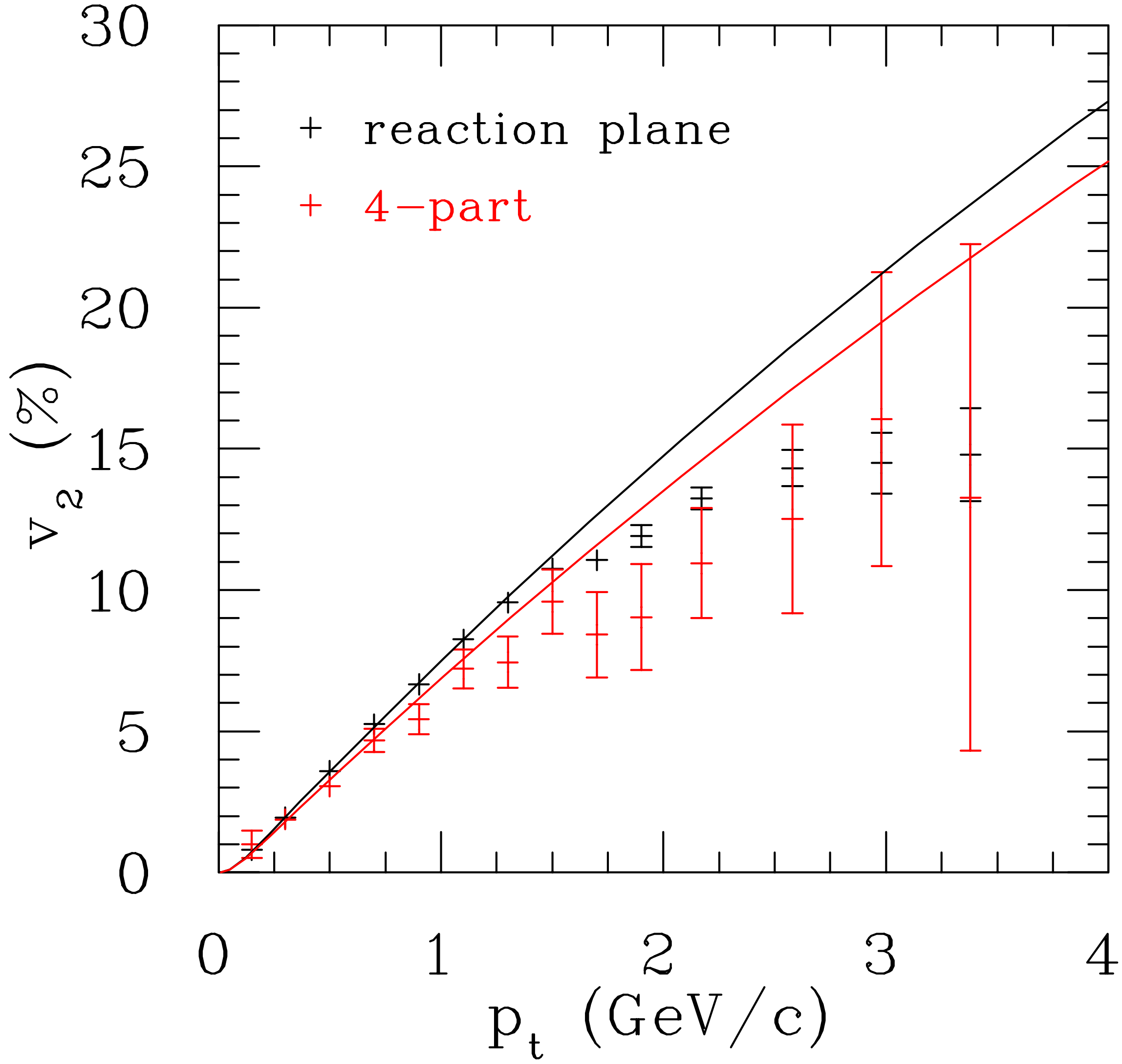
5%–10% centrality, $3.3 < b < 4.7$ fm



Data: STAR, Phys. Rev. C **66**, 034904 (2002)

Charged hadrons, $v_2(p_t)$

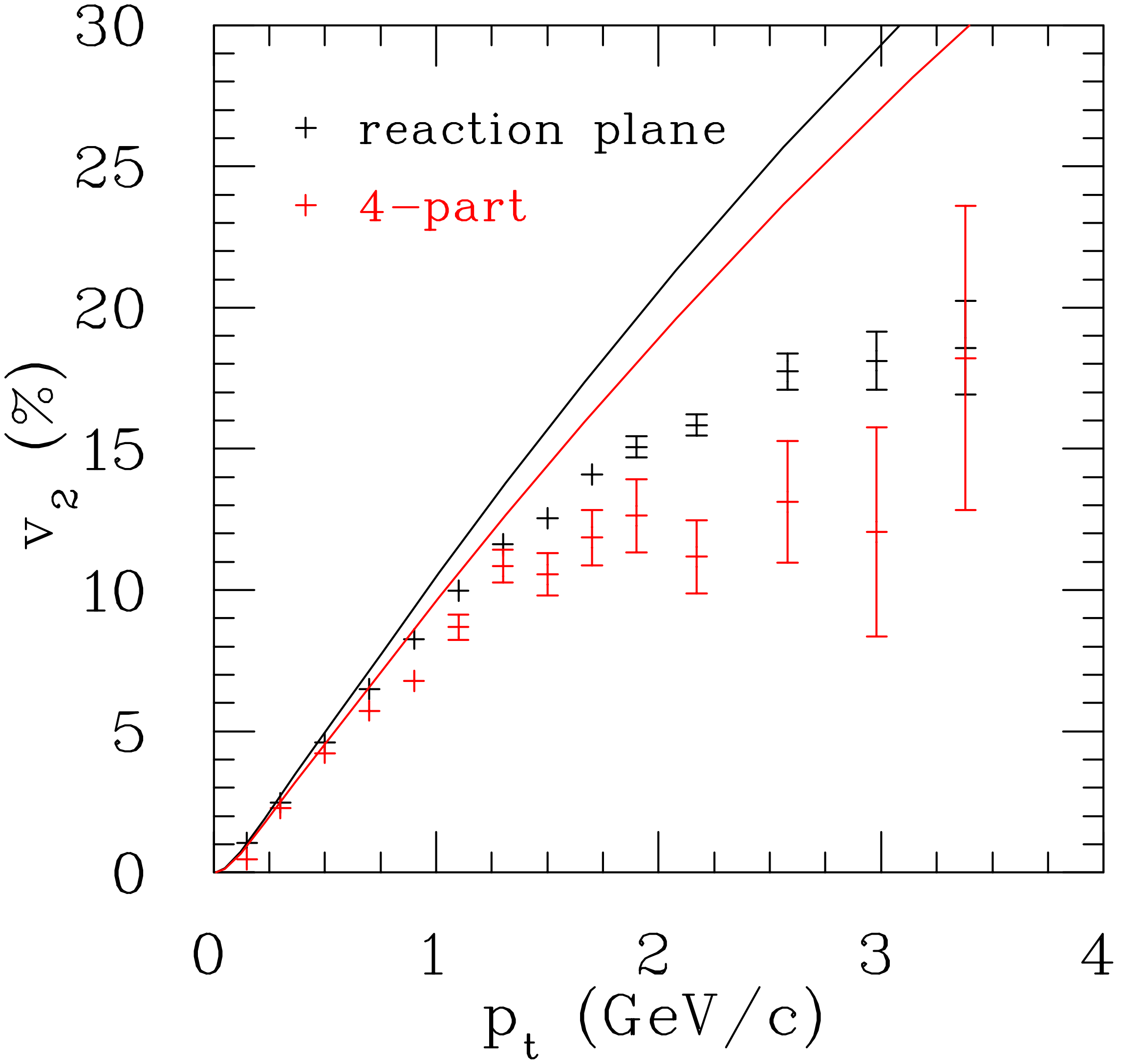
10%–16% centrality, $4.7 < b < 5.9$ fm



Data: STAR, Phys. Rev. C **66**, 034904 (2002)

Charged hadrons, $v_2(p_t)$

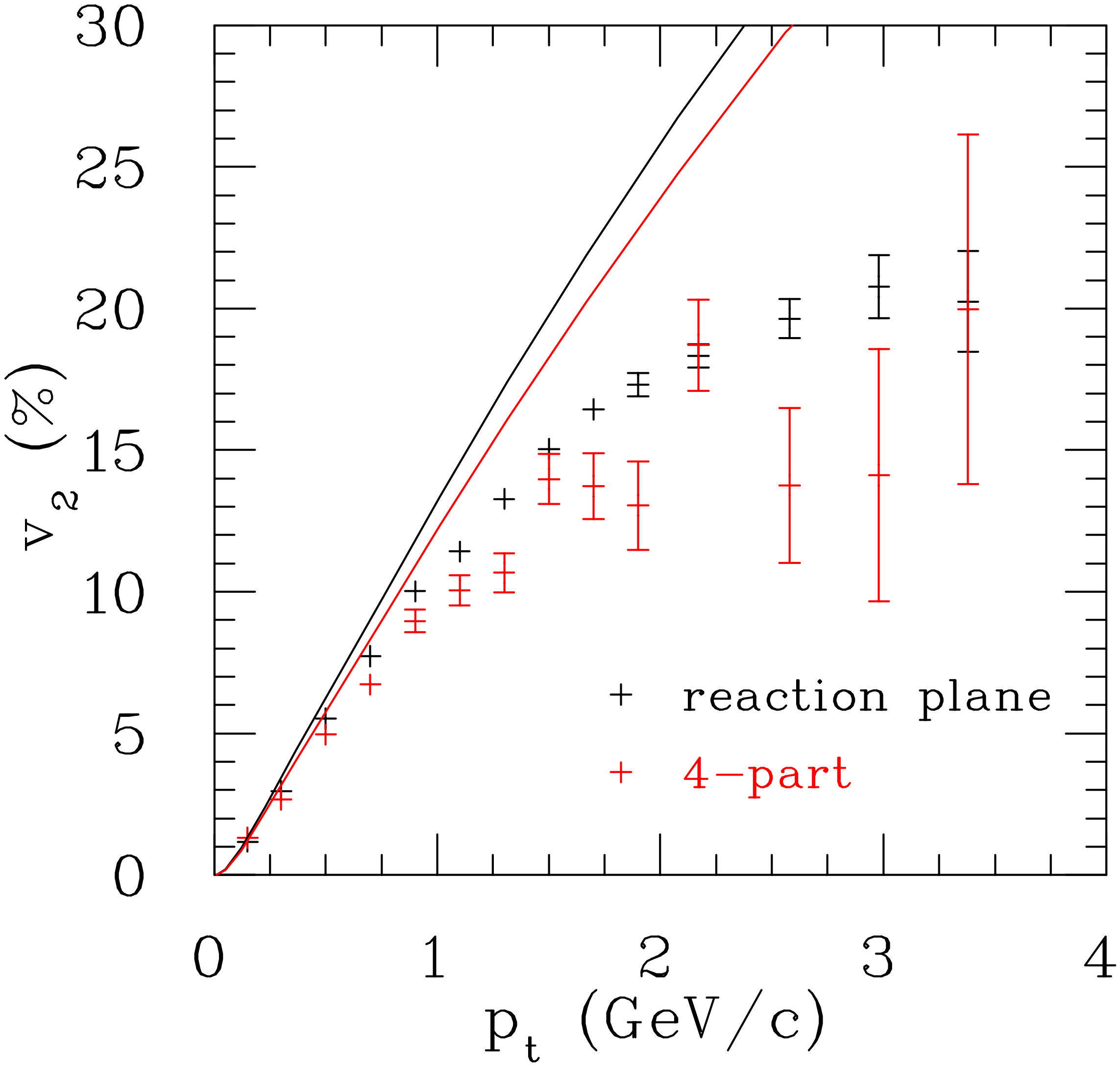
16%–24% centrality, $5.9 < b < 7.3$ fm



Data: STAR, Phys. Rev. C **66**, 034904 (2002)

Charged hadrons, $v_2(p_t)$

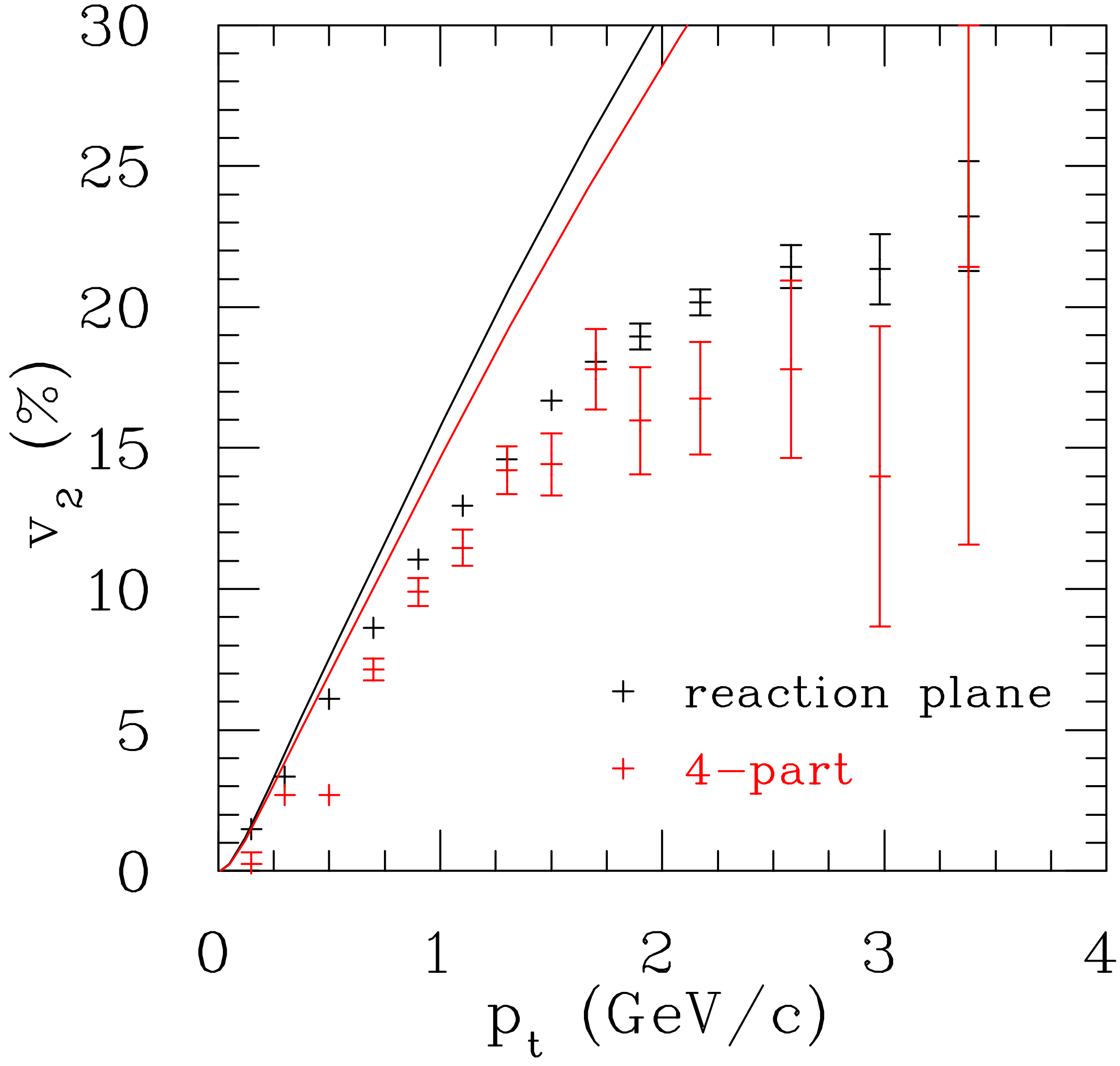
24%–31% centrality, $7.3 < b < 8.3$ fm



Data: STAR, Phys. Rev. C **66**, 034904 (2002)

Charged hadrons, $v_2(p_t)$

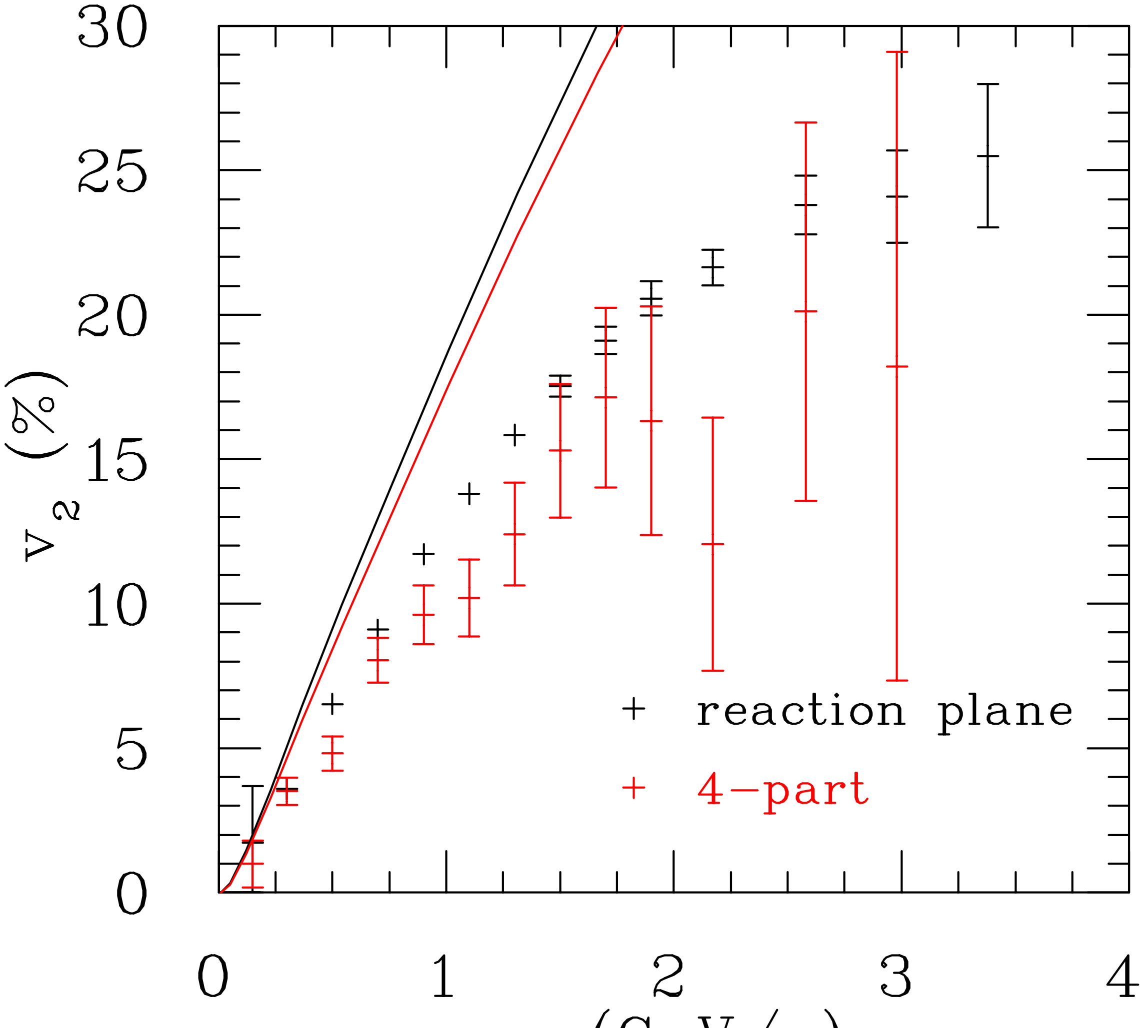
31%–41% centrality, $8.3 < b < 9.5$ fm



Data: STAR, Phys. Rev. C **66**, 034904 (2002)

Charged hadrons, $v_2(p_t)$

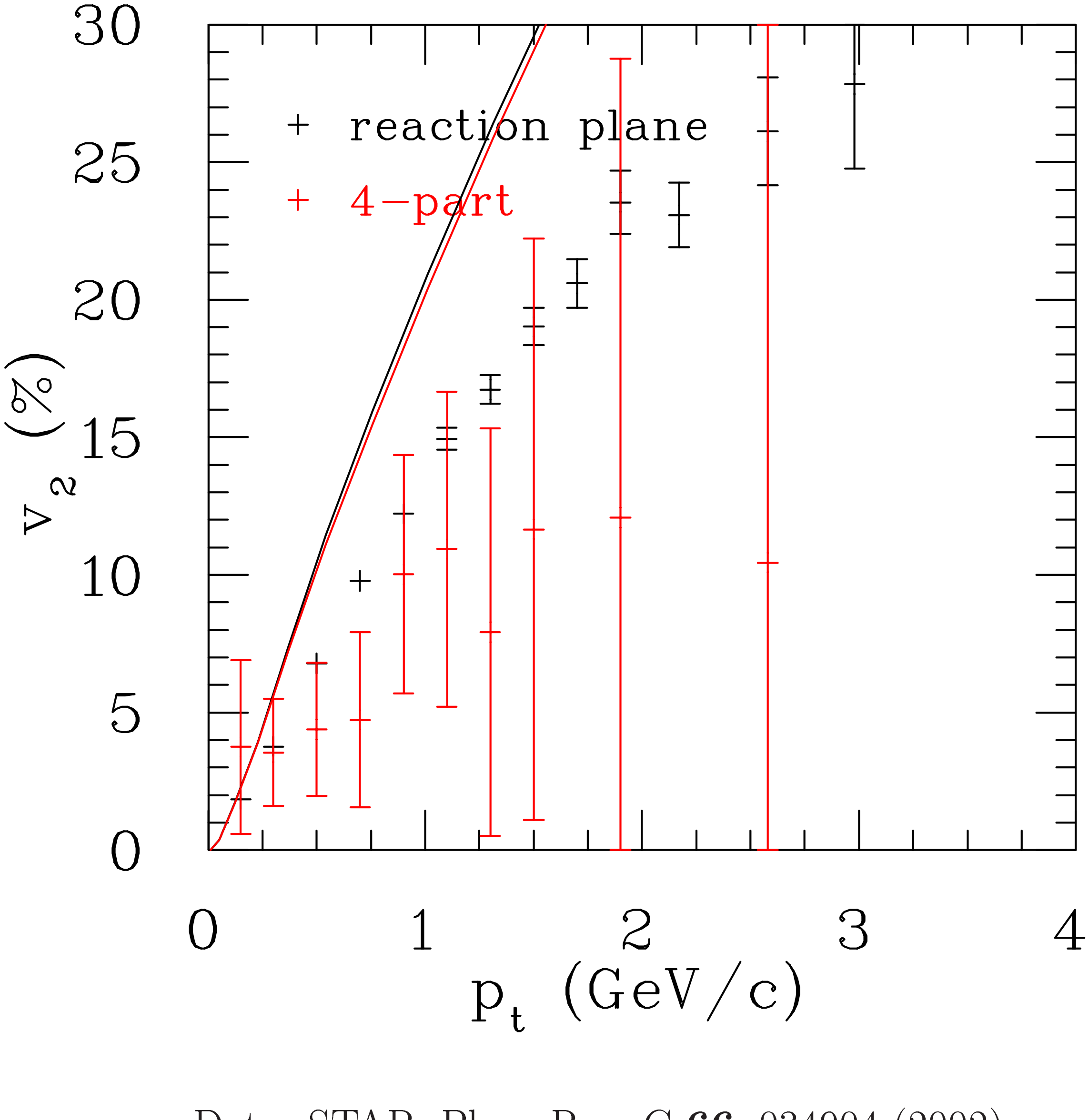
41%–53% centrality, $9.5 < b < 10.8$ fm



Data: STAR, Phys. Rev. C **66**, 034904 (2002)

Charged hadrons, $v_2(p_t)$

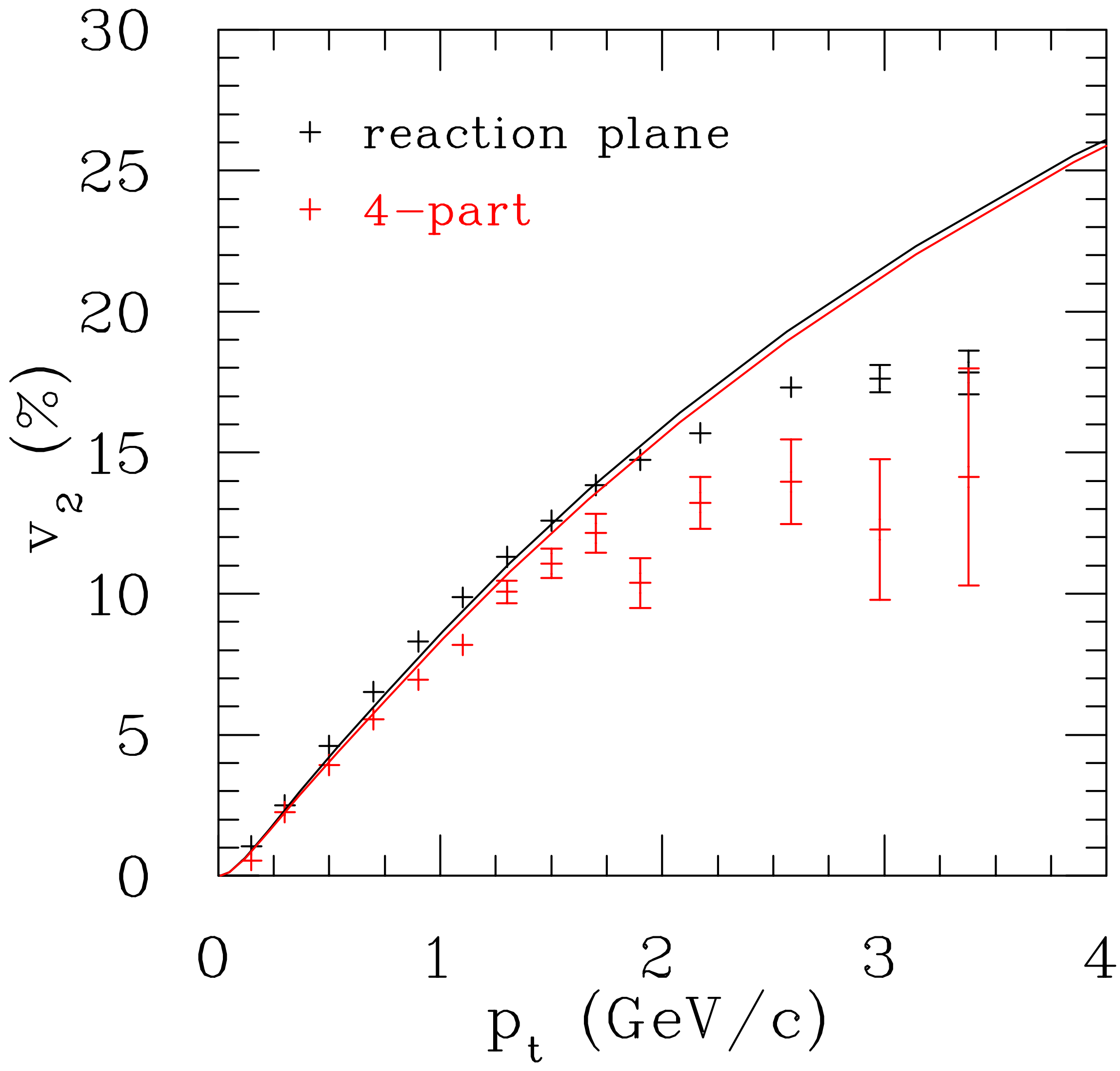
53%–77% centrality, $10.8 < b < 13.1$ fm



Data: STAR, Phys. Rev. C **66**, 034904 (2002)

Charged hadrons, $v_2(p_t)$

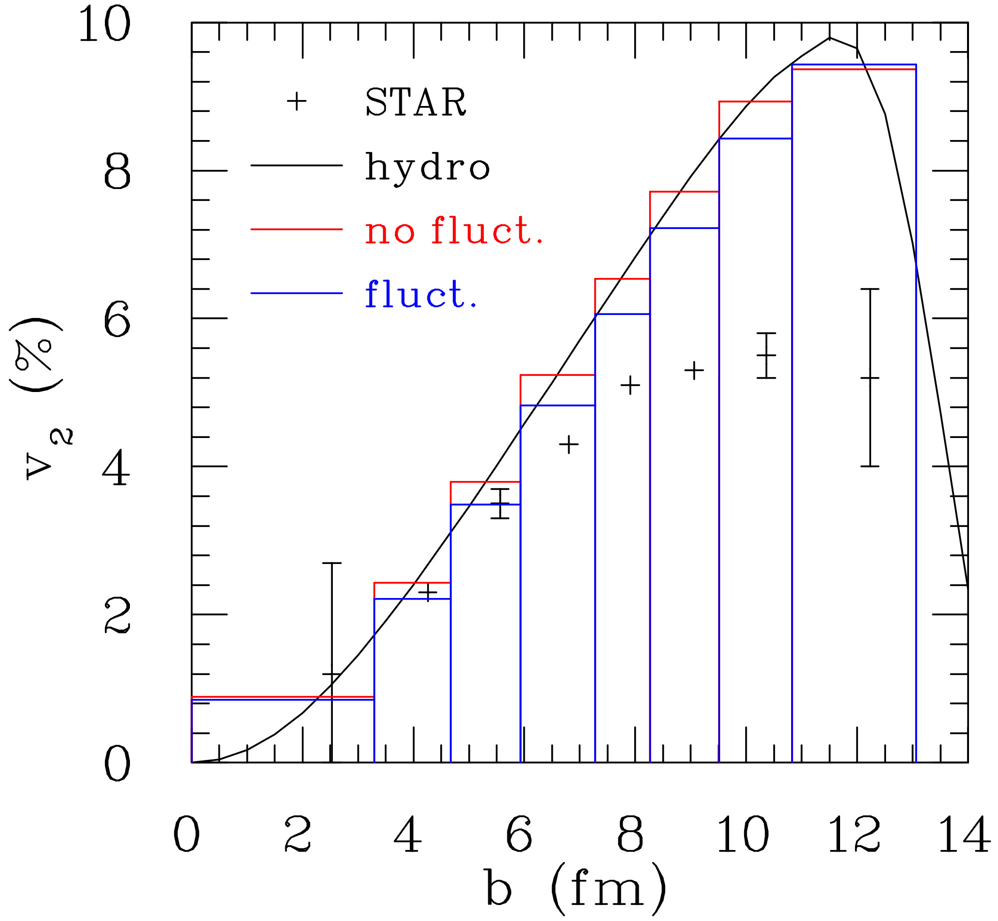
5%–53% centrality, $3.3 < b < 10.8$ fm



Data: STAR, Phys. Rev. C **66**, 034904 (2002)

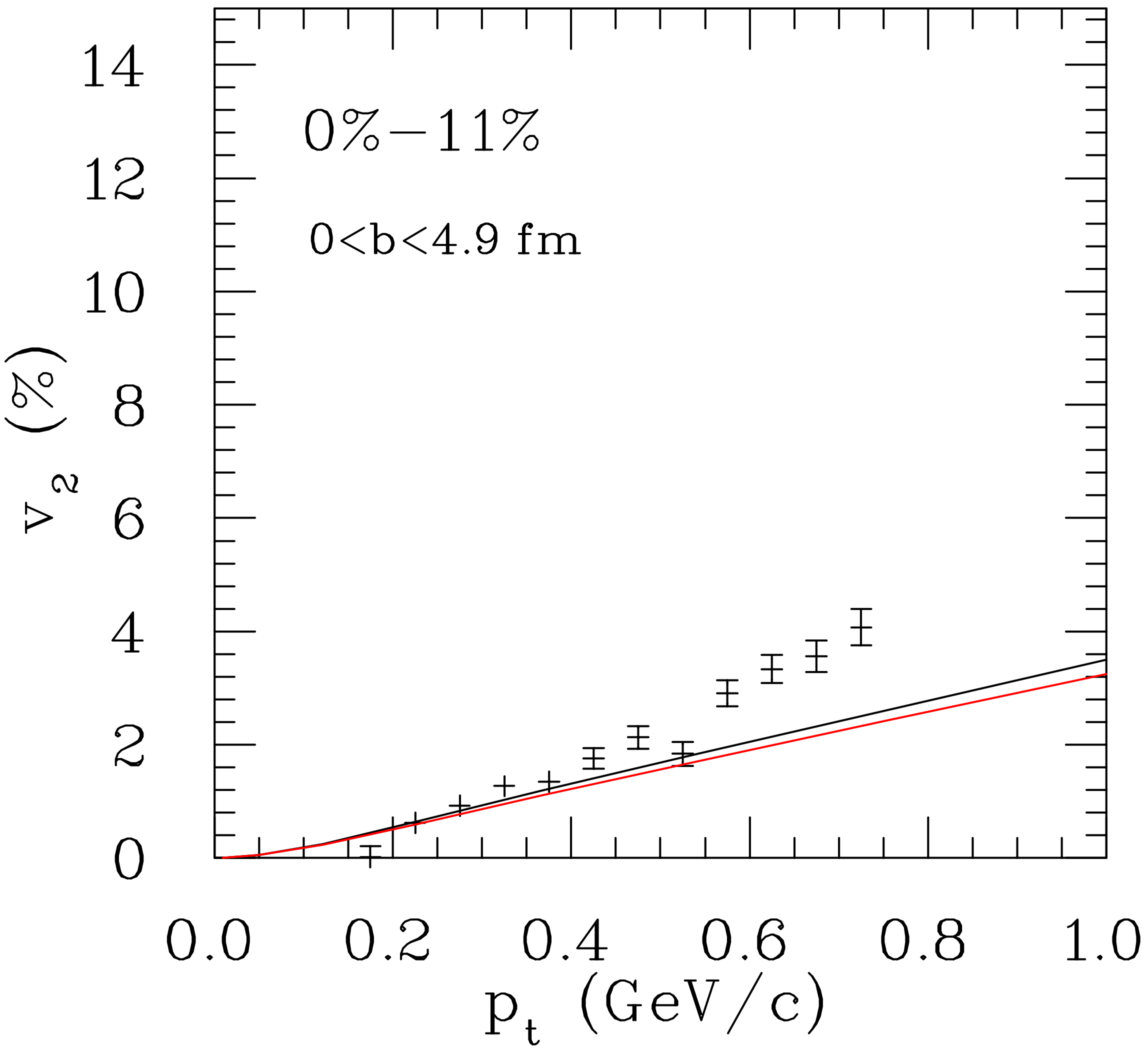
Elliptic anisotropy v_2 as function of centrality

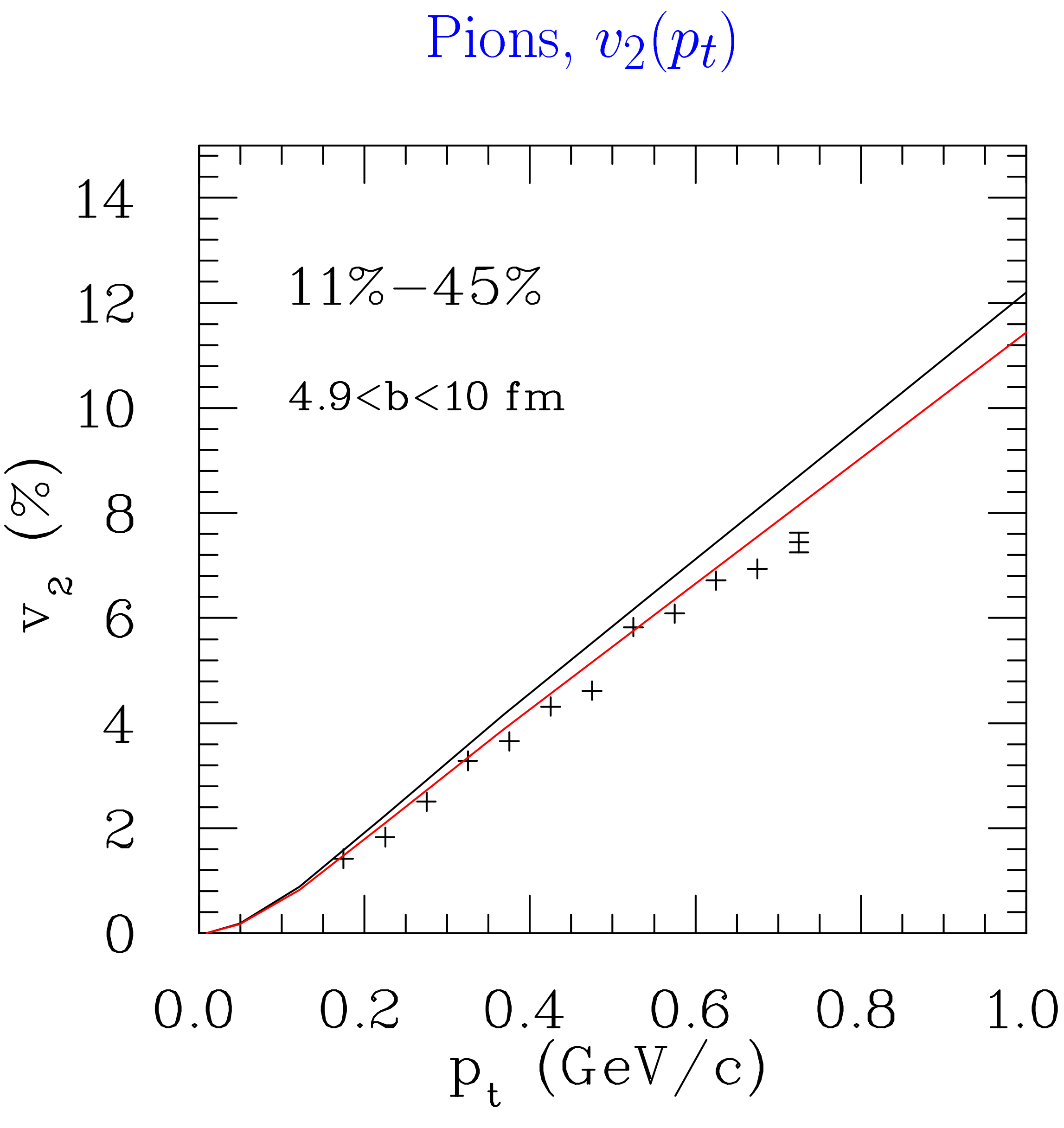
Charged particles



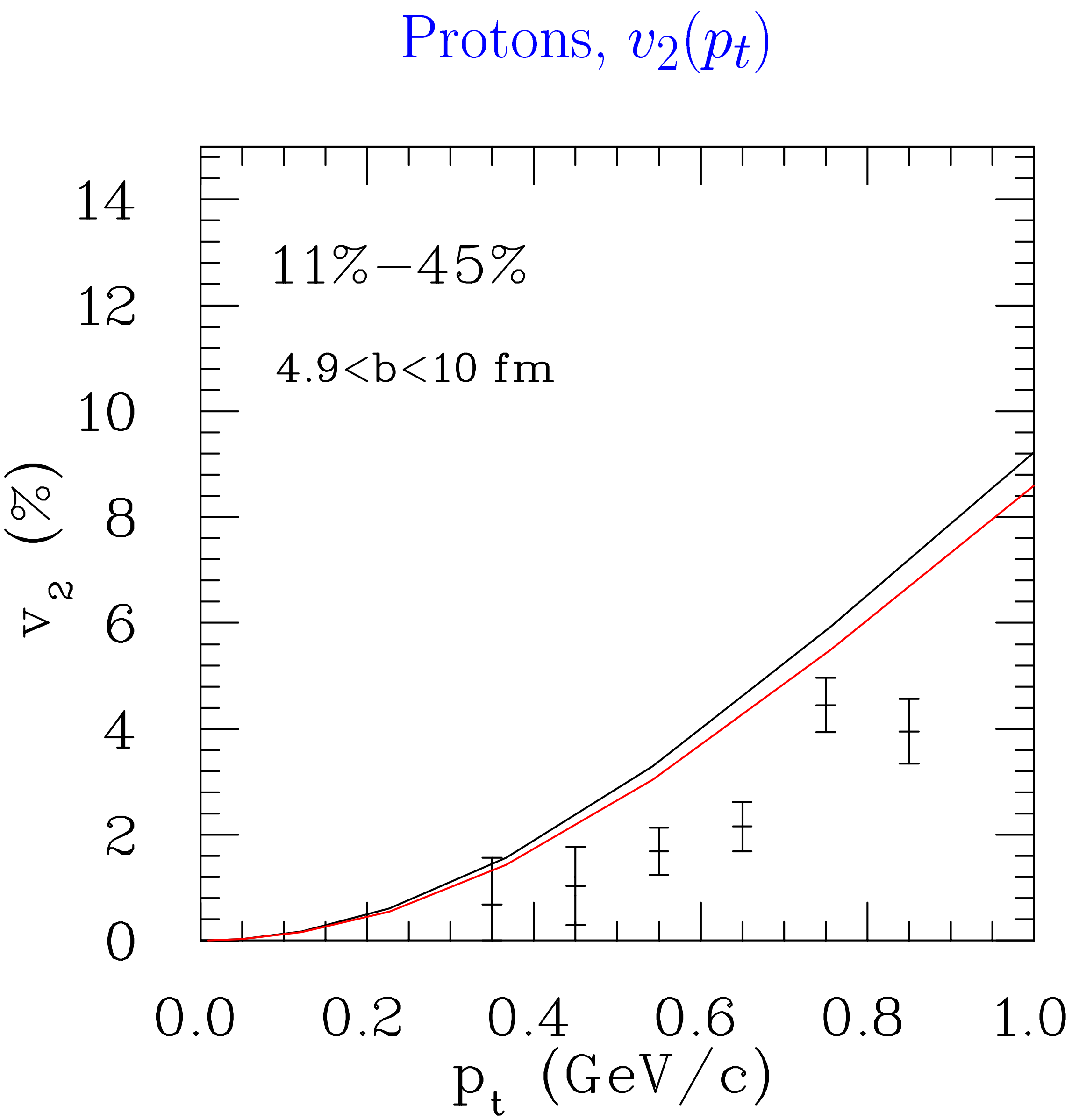
Data: STAR, Phys. Rev. C **66**, 034904 (2002)

Pions, $v_2(p_t)$





Pions, $v_2(p_t)$
11%−45%
4.9<b<10 fm
v_2 (%)
p_t (GeV/c)
0
2
4
6
8
10
12
14
0.0
0.2
0.4
0.6
0.8
1.0



Protons, $v_2(p_t)$
11%−45%
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v_2 (%)
p_t (GeV/c)
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2
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0.0
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0.6
0.8
1.0

Summary

- Most central collisions: hydro below the data(!)
- 5%-16% centrality, i.e. $b \sim 3-6$ fm, hydro reproduces the data up to $p_t = 1.5$–2.5 GeV
- The p_t region where hydro fits the data becomes smaller with increasing impact parameter.