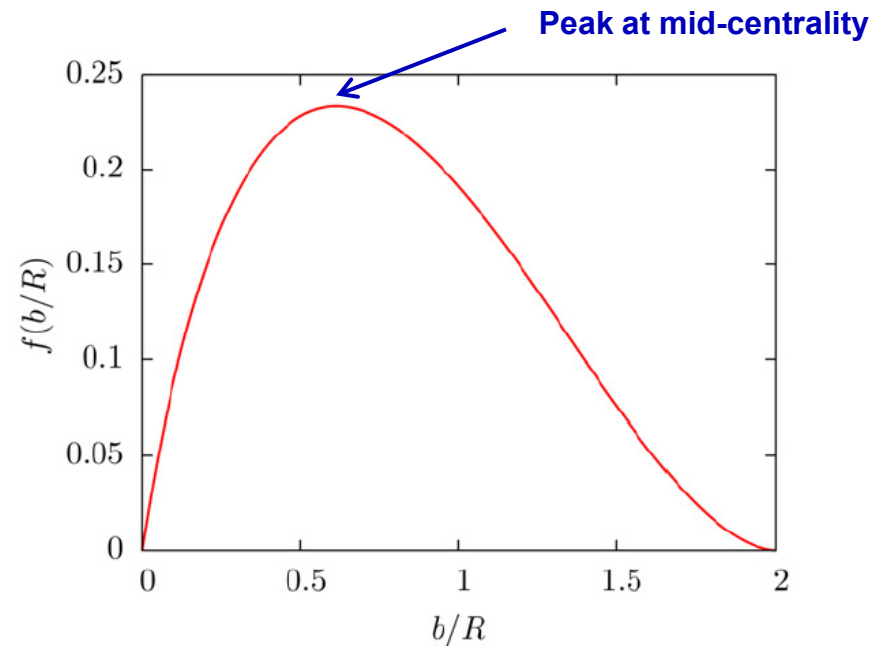
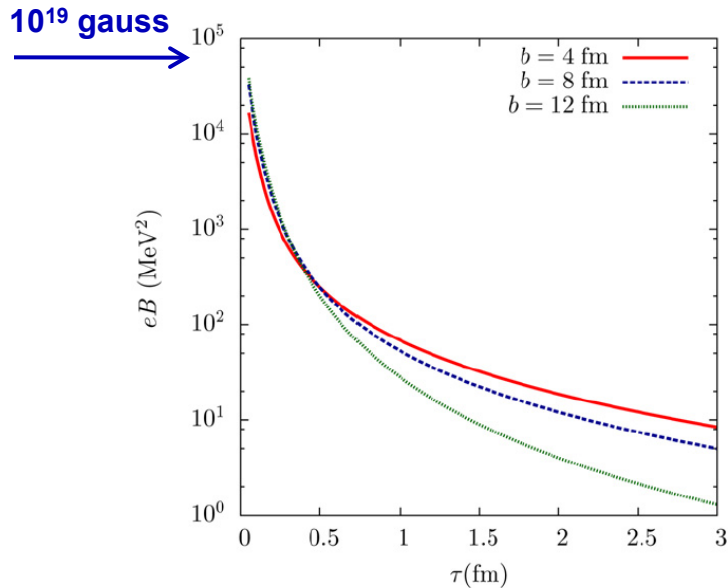


# PWG Notes

*October 4<sup>th</sup>, 2010*

**Jim Thomas**

- The B field lies at the heart of Khazzeev's calculation of the Chiral Magnetic Effect



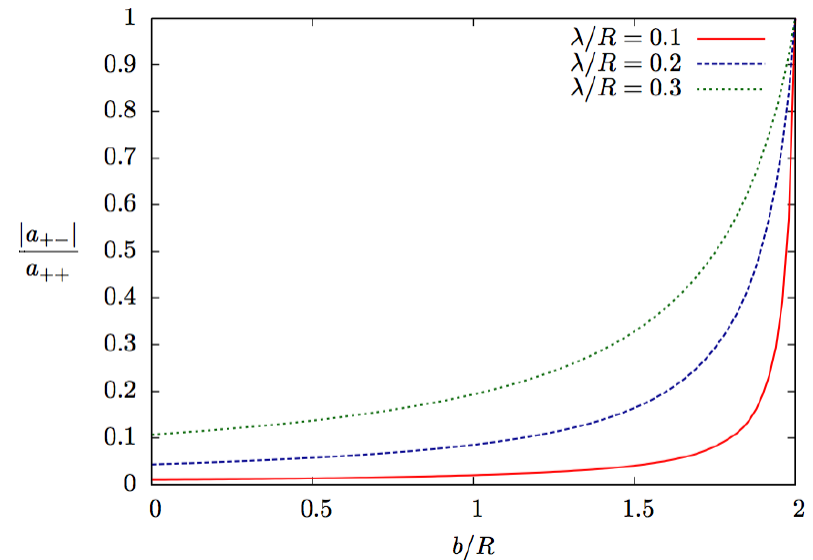
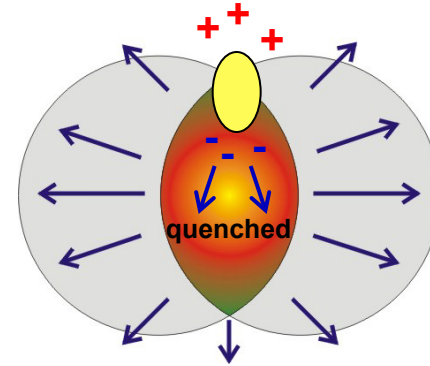
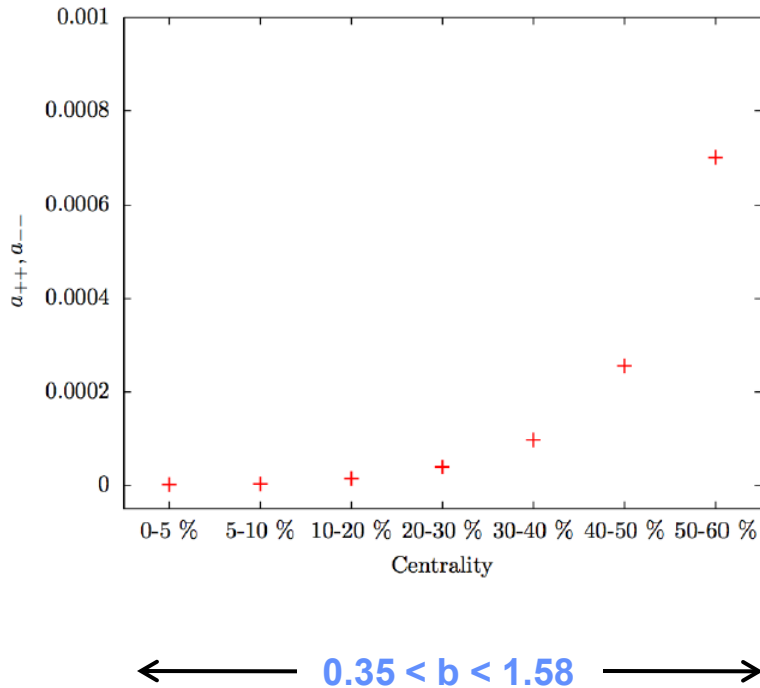
- It depends on time and the impact parameter with contributions from the participants

$$eB_p \approx cZ\alpha_{EM} \exp(-Y_0/2) \frac{1}{R^{1/2}\tau^{3/2}} f(b/R)$$

and from the spectators

$$eB_s \approx Z\alpha_{EM} \exp(-2Y_0) \frac{4b}{\tau^3}$$

# Kharzeev's calculation of the CME effect



- Kharzeev also suggests 'bubble' on edge of collision zone and one side absorbed

The important point is that the theory, and our hypothesis, is a linear function of the impact parameter,  $b$ .

- The remarkable thing is that Müller and Schäfer agree on all of the essential points of the theory
- By a different technique, they get the same induced electric current as Kharzeev et al.
- They use the same magnetic field
- They find that the electric field energy is

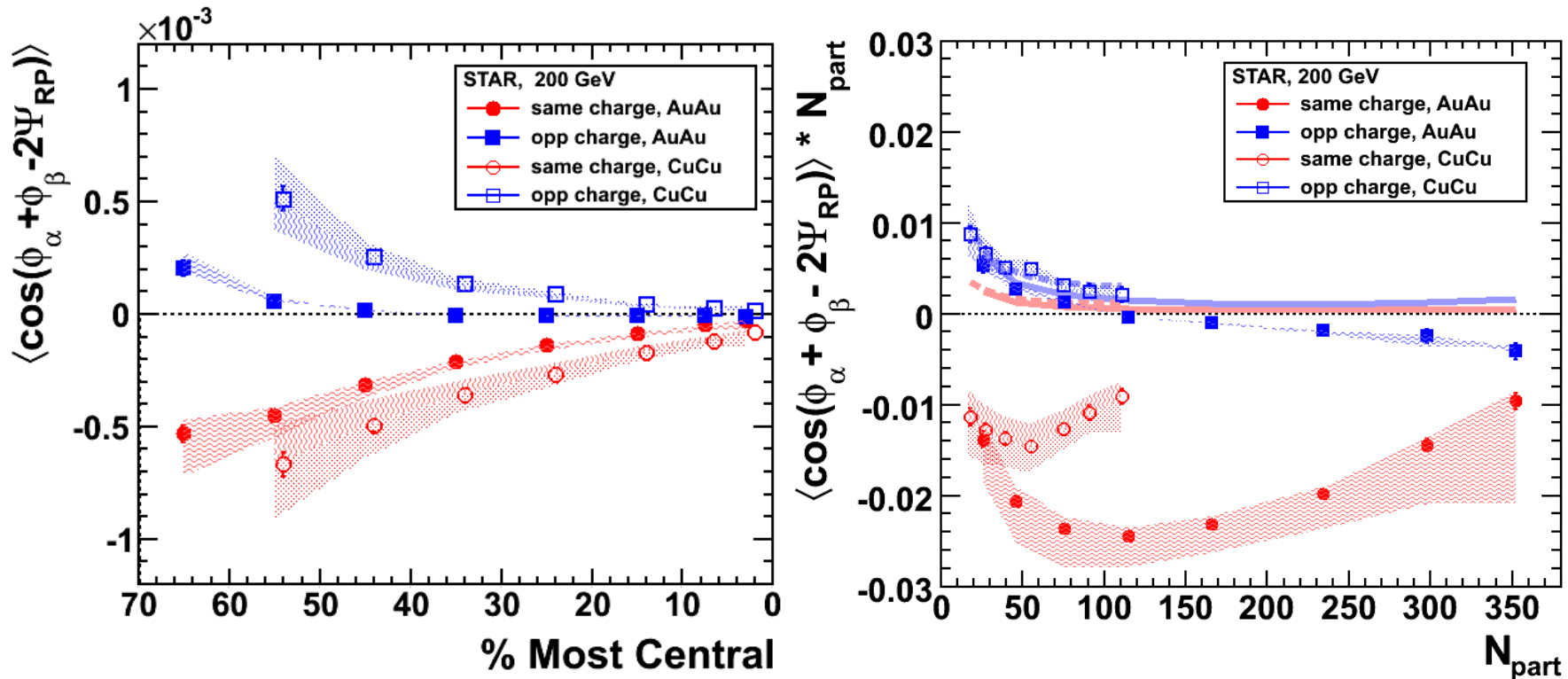
$$|eE_{\min}| \approx (6 \text{ MeV})^2 (b/R).$$

and the correlation for the charge separation should be

$$\Delta^{\pm} \approx 0.85 \times 10^{-5} \frac{b}{R},$$

- The key difference between Kharzeev et al and Müller and Schäfer is that Kharzeev assumes a constant magnetic field while Müller assume a time averaged field.
  - This is an important difference ... but that's why we are here

The important point is that the fundamental theory is not disputed, and the hypothesis we are testing is a function of impact parameter,  $b$ . Our job is to find the magnitude of the effect ... if we can.



- $N_{part}$  by  $N_{part}$  scaling is interesting ... but nothing in the theory depends on  $N_{part}$ .  $N_{part}$  by  $N_{part}$  scaling obscures the hypothesized signal. It may be an interesting way to study the background ... but not the signal.
- The hypothesis is a function of impact parameter and should be studied as a function of  $b$  (or equivalently, % centrality).

This is why it is important to plot the hypothesis as a function of  $b$ .