Brookhaven National Laboratory

U.S. DEPARTMENT OF ENERGY

Like-Sign Pairs for Background Subtraction in Coherent J/ψ Events

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In the Simulation Note

Coherent J/ψ events

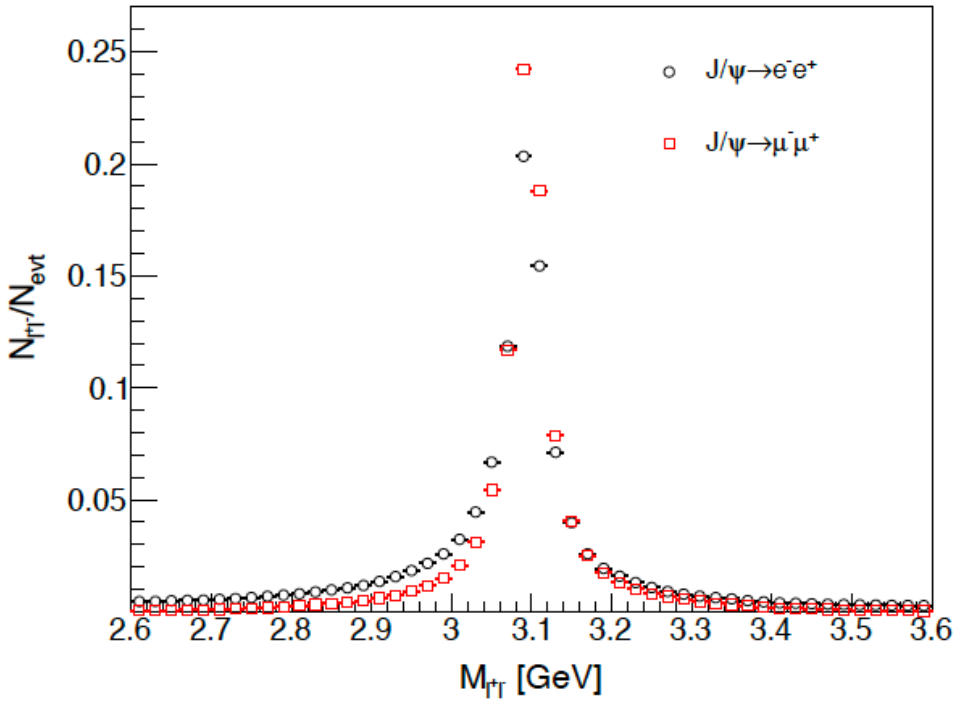
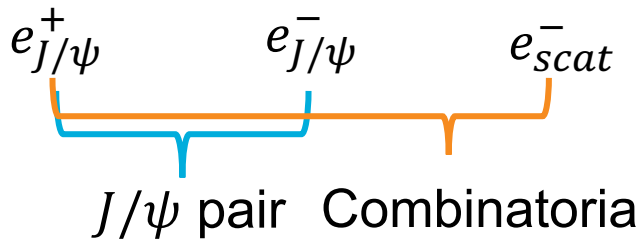


Figure 5: Invariant mass spectra of dilepton.

- I claimed that the dielectron channel is contaminated with scattered election
- Thomas suggested like-sign pair can be used to subtract the contamination

Like-Sign Subtraction

In each coherent J/ψ event, there are $J/\psi \to e^+e^-$ and a scattered e^-



- Thus, there are 2 pairs of unlike-sign dielectron in each events $N^{+,-} = 2$, of which $N^{+,-}_{J/\psi} = 1$, and $N^{+,-}_{comb} = 1$

Like-Sign Subtraction

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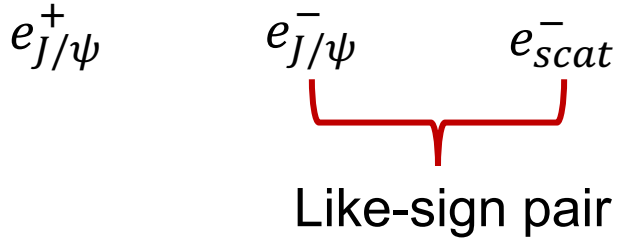
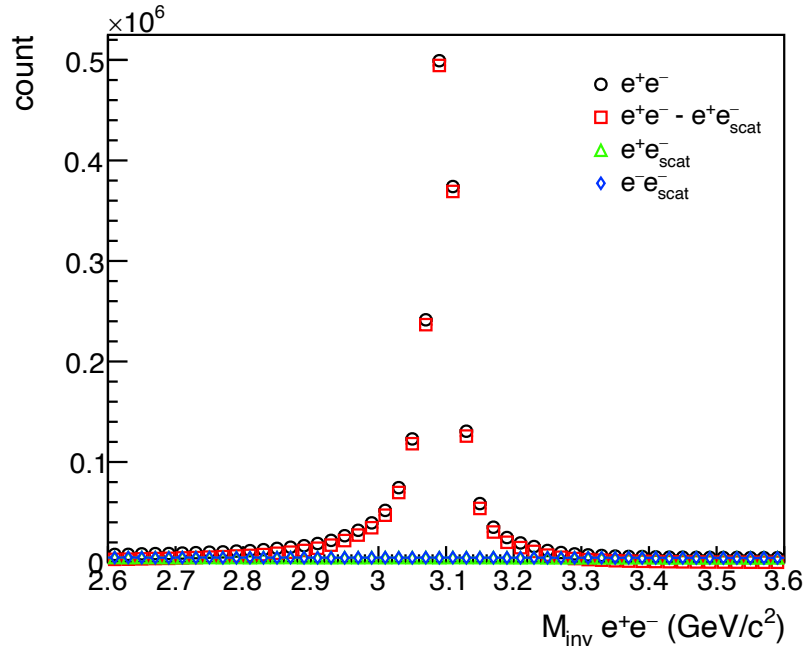
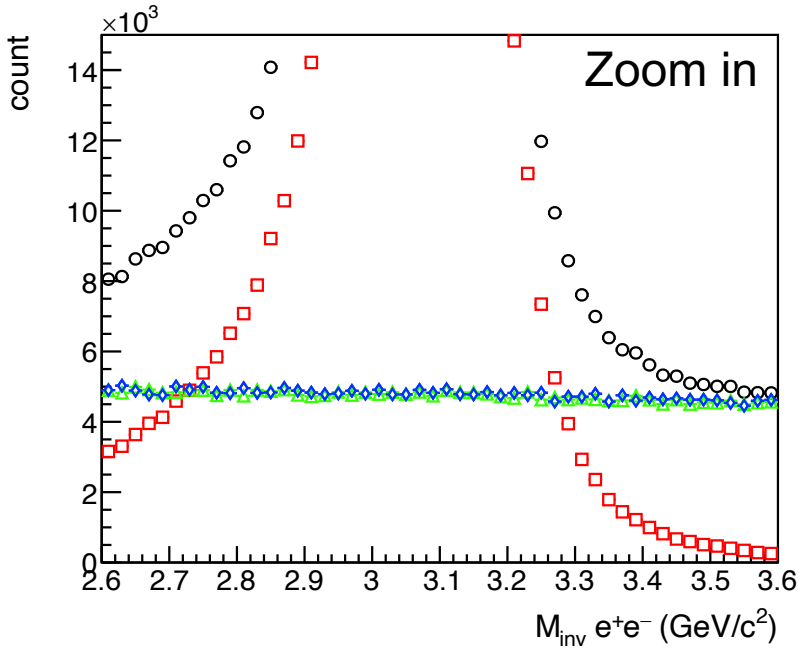


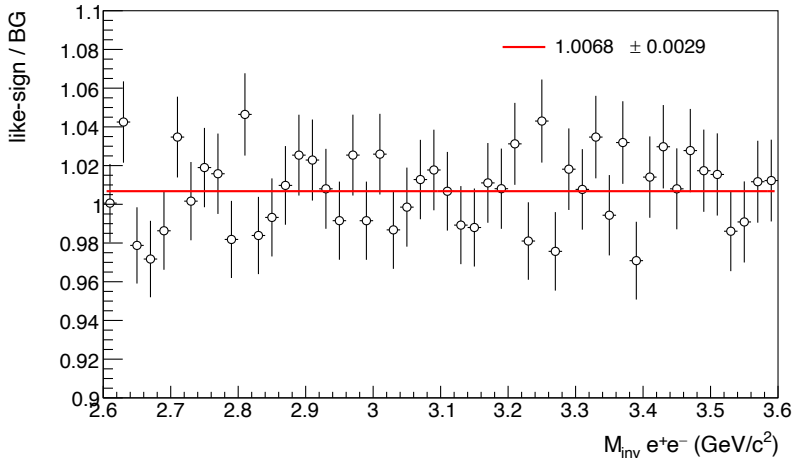
- Thus, there are 2 pairs of unlike-sign dielectron in each events $N^{+,-} = 2$, of which $N^{+,-}_{J/\psi} = 1$, and $N^{+,-}_{comb} = 1$
- And 1 pair of like-sign dielectron $\boldsymbol{N^{-,-}_{comb} = N^{+,-}_{comb} = 1}$

Mass Distribution with Like- and Unlike-sign pairs





Good description of the combinatorial scattered electron background using like-sign pairs



Question

- I understand background subtractions are essential for J/ψ production measurements
- Can we apply like-sign pair background subtractions in t measurements?