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UPDATE ON SOLID J/Ψ BIN MIGRATION AND BACKGROUND

RECENT DEVELOPMENTS WITH RADIATIVE LOSS / RESOLUTION

- Simulation of the J/ψ cross-section including resolution and radiative effects was performed.
  - Resolution of all detected particles was smeared according to resolution studies of the GEMs, and the provided code from Weizhi and Zhiwen was used.
  - Since this is a GEMC/GEANT4 simulation, external radiation loss post-vertex is folded into the resolution somewhat.
    - Resolution is given as sigma of gaussian, so total resolution effect is gaussian about input/generated momentum and NOT skewed downward in energy!
  - Target material is included, but vertex is assumed at center of target. (on average, results should be close to a distributed vertex)

RECENT DEVELOPMENTS WITH RADIATIVE LOSS / RESOLUTION

- External Bremsstrahlung is approximated by:

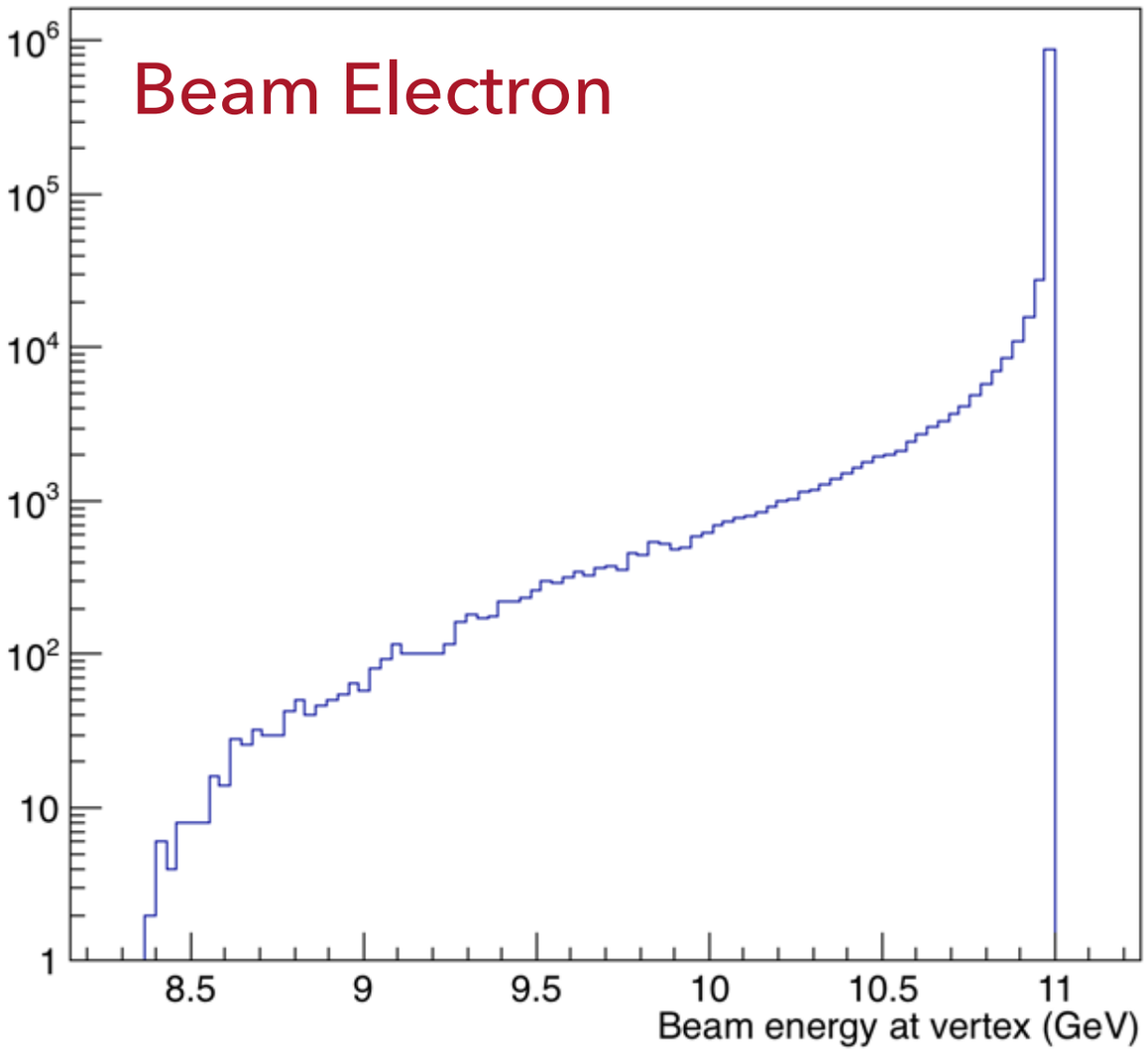
$$\text{Prob.} \approx \left(\frac{\Delta E}{E}\right)^{bt}$$

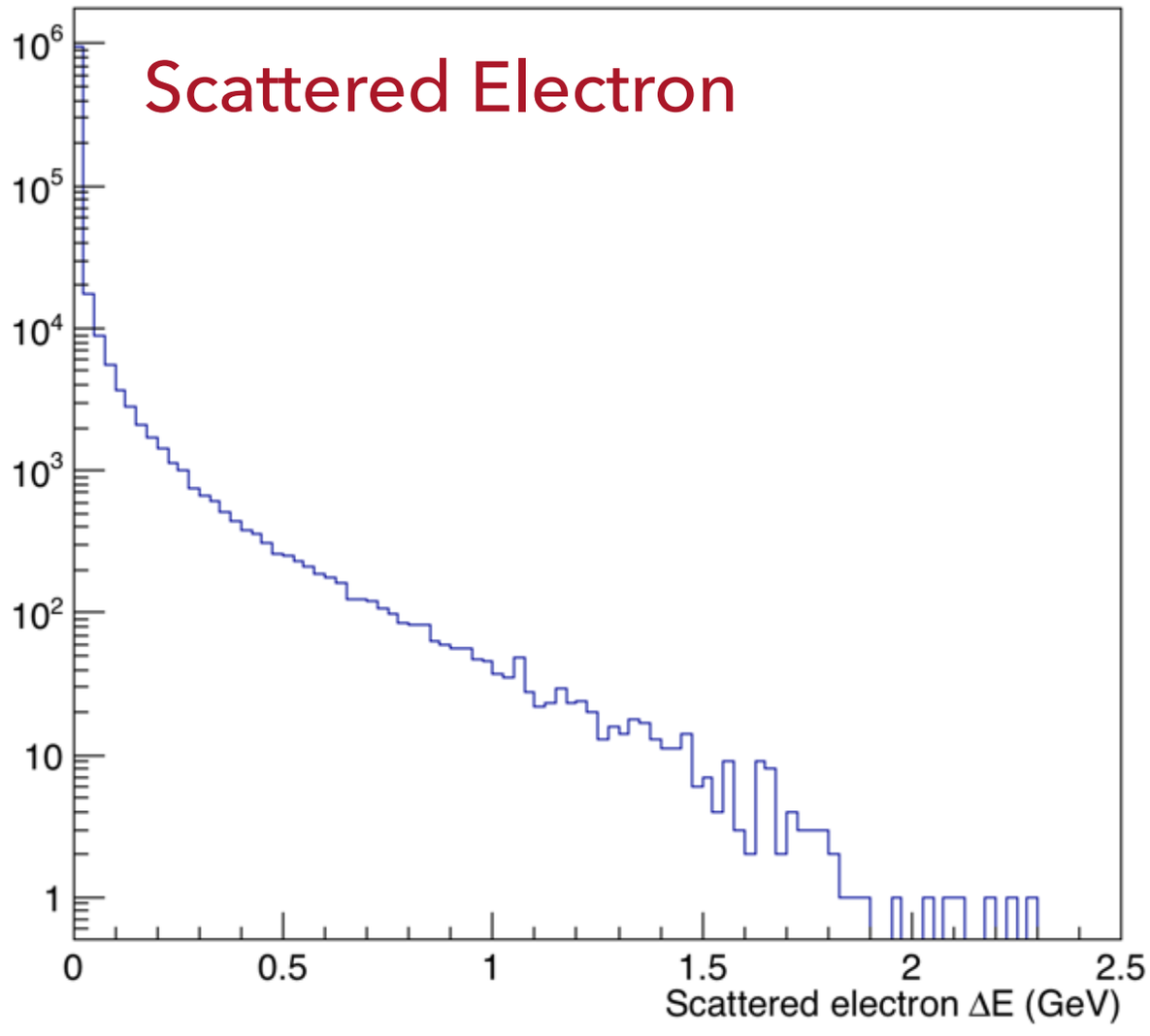
  - where b is a Z dependent nuclear factor (typically close to 4/3, see Mo/Tsai) and t is the thickness normalized to radiation length.
  - This external loss is applied to the beam electron through half the target length (7.5cm). Windows were not considered.

- Internal radiation was approximated using the equivalent radiator method, and is applied to both before and after the vertex according to:

$$t_{\text{eff}} \approx \frac{3\alpha}{4\pi}[\ln(Q^2/m_e^2) - 1]$$

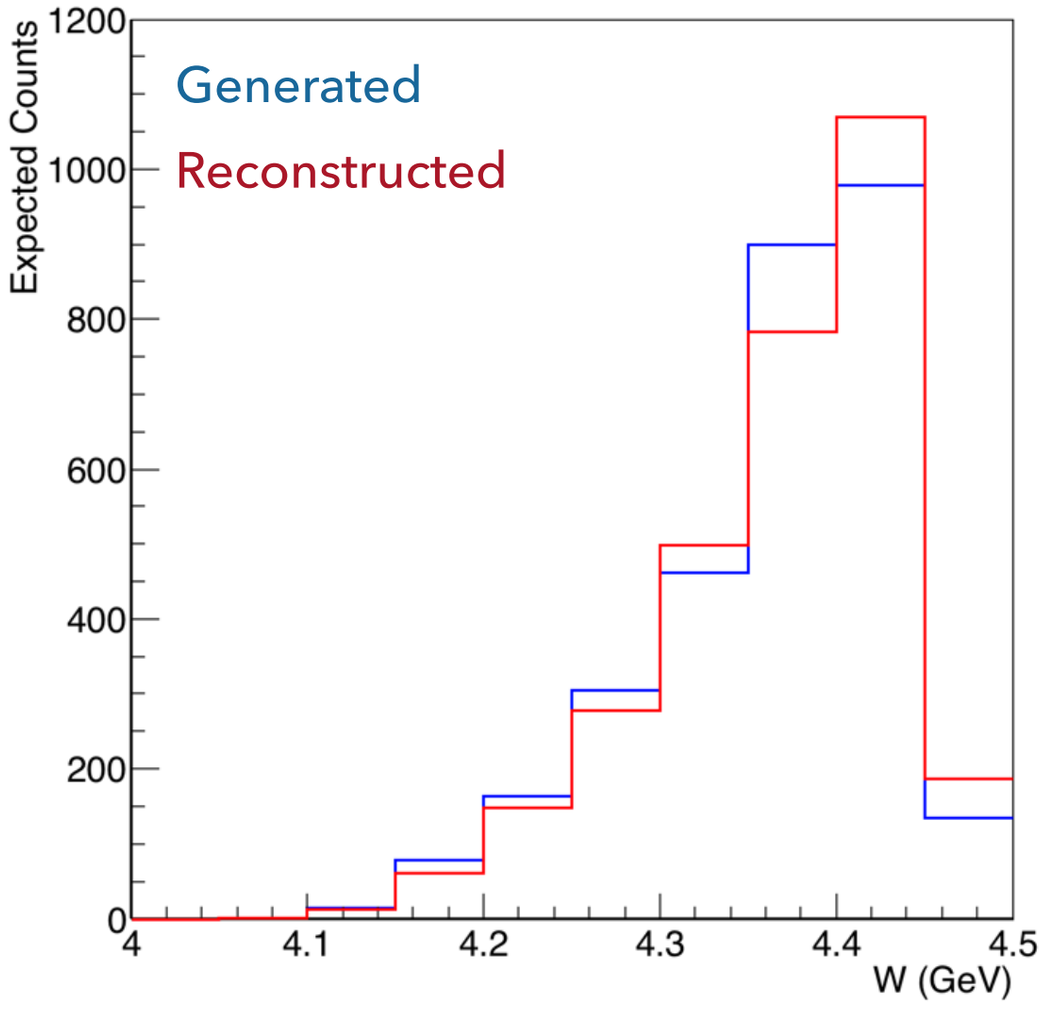
INTERNAL + EXTERNAL RADIATION LOSS

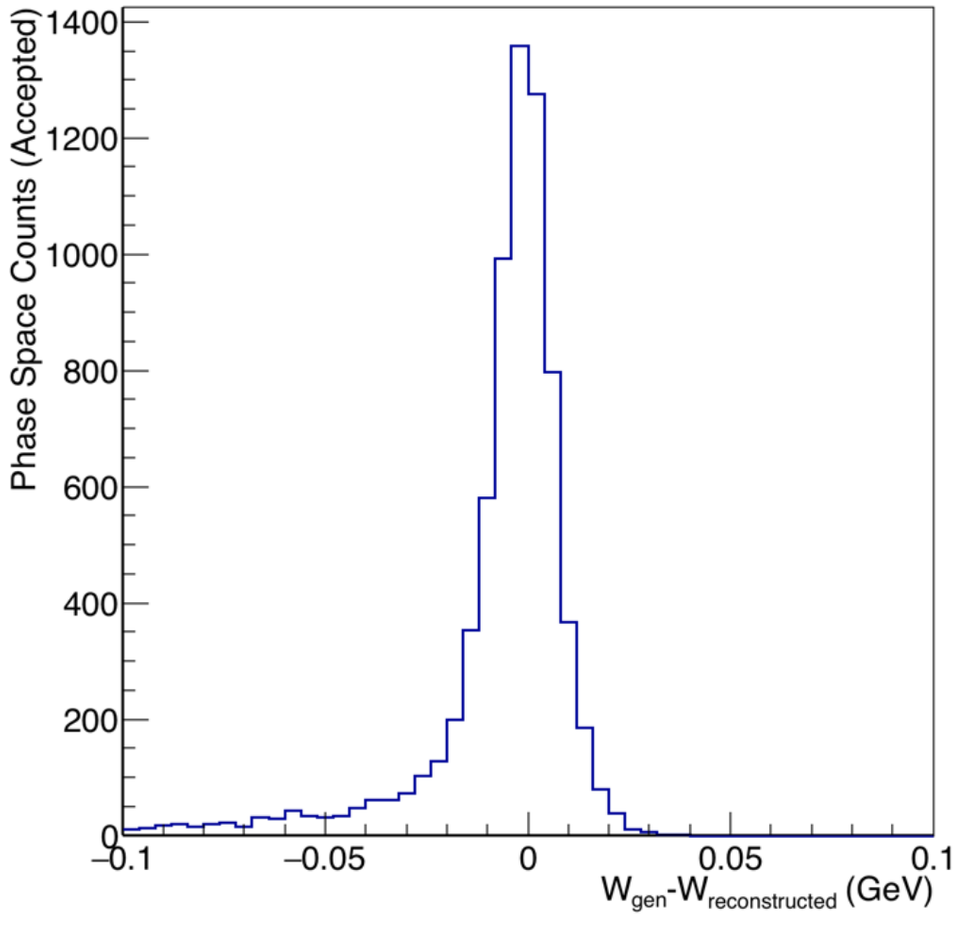


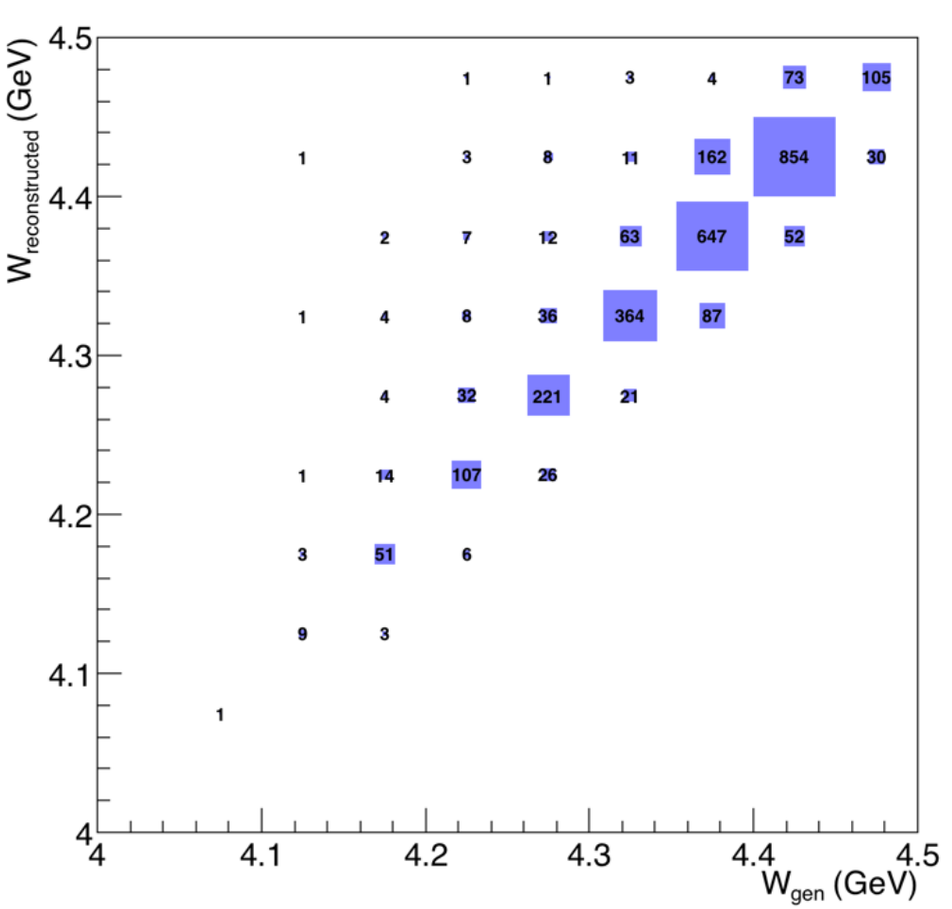


RESOLUTION EFFECT ON W

- Total effect on counts binned in W
- So far, only 4-fold coincidence is studied (including proton in large angle acceptance)

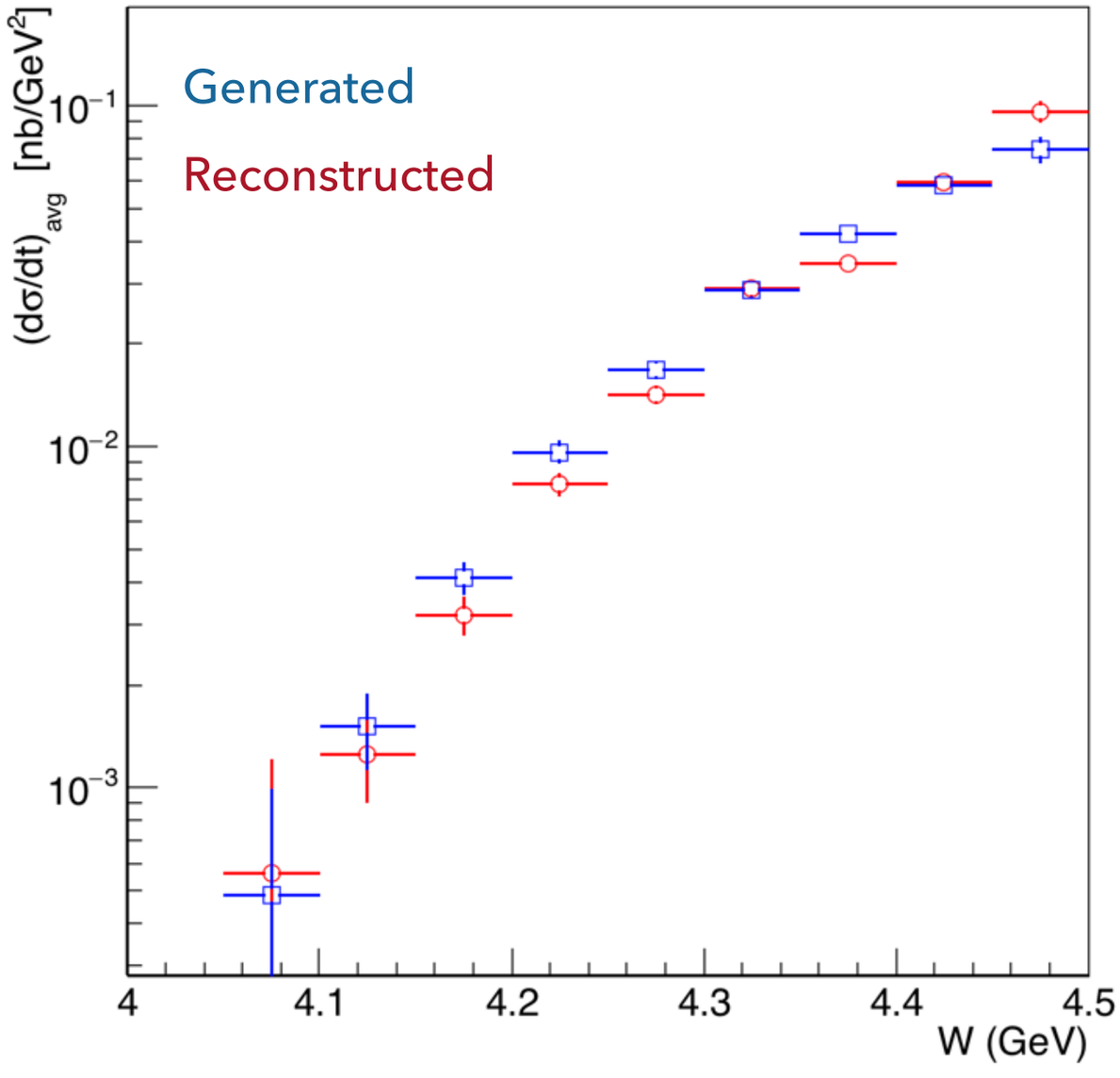






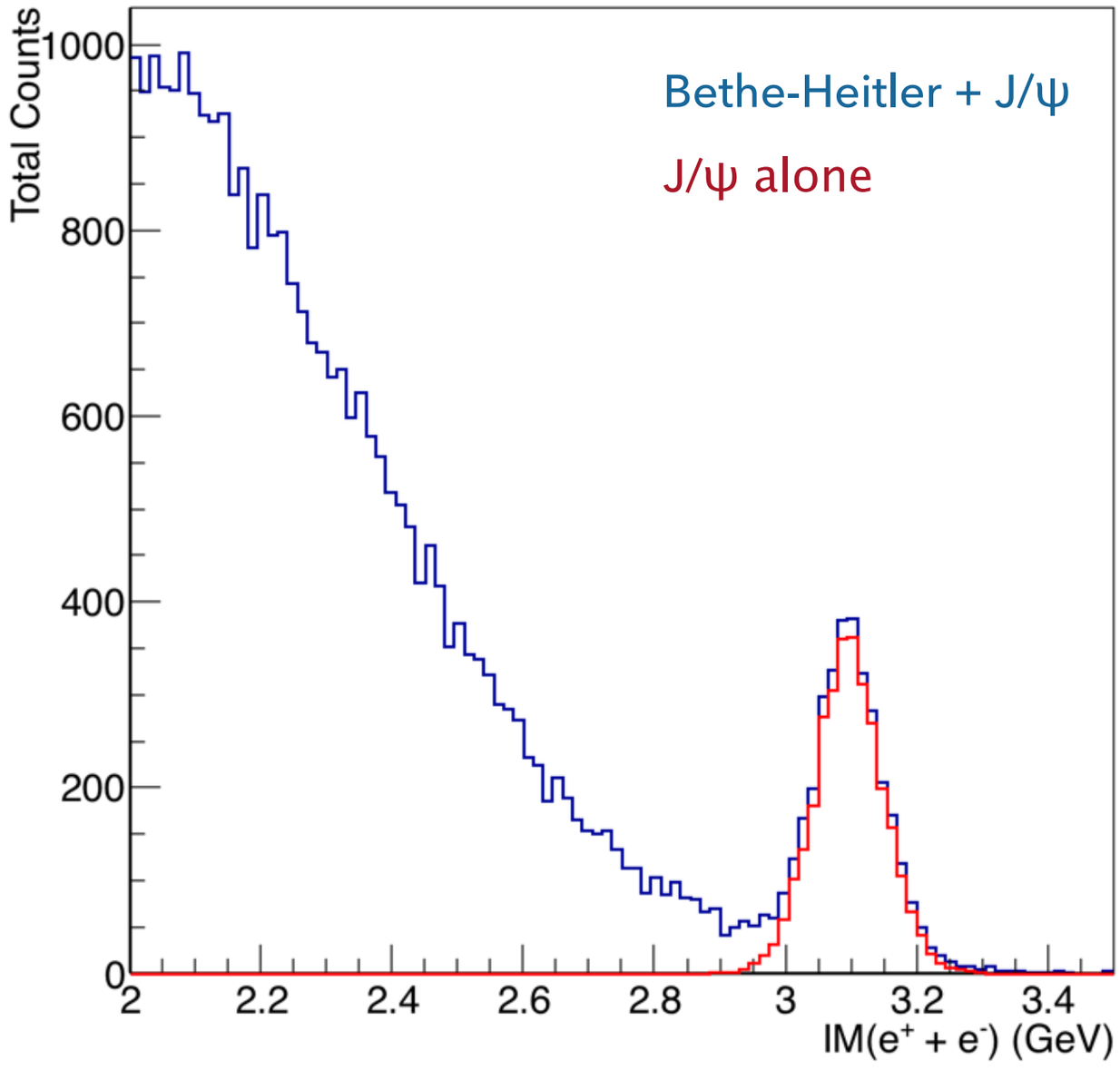
RESOLUTION/RADIATION EFFECT ON W

- Total effect on XS
  - Assuming we handle counts with complete naivety to the radiative and resolution effects.
- Effects are small, but larger than the expected statistical uncertainty at larger W.



RESOLUTION/RADIATION EFFECT ON SIGNAL/BACKGROUND

- So far only 4-fold coincidence is considered.
- Proton is allowed in large angle acceptance.
- Bethe-Heitler and signal is still rather well separated.



FUTURE PLANS:

- More exact calculation of radiative effects is needed, which will require more manpower.
- Investigate the handling of radiative effects folded into the resolution.
- Migrate generation code to new, more robust, simulation program.
  - Sylvester has started work on this, using the base program for recently approved Pc proposal.
- Study radiative effects for 3-fold coincidence
- Study the t-bin migration effect
- Calculate the XS contamination due to Bethe-Heitler, including resolution and radiative effects.
- Efficiency studies need to be revisited.
- 2-pion backgrounds need to be included in signal/background.