$$e + A \rightarrow e' + A' + J/\psi$$

Coherent/Incoherent Studies

Baseline

$e^{\pm}$ from J/ψ: $$\frac{\sigma_{p_T}}{p_T}(\%) = 0.05\ p_T \oplus 0.5$$

$$-1.5 < \eta < 1.5$$

$$p_T > 0.5\ \mathrm{GeV}/c$$

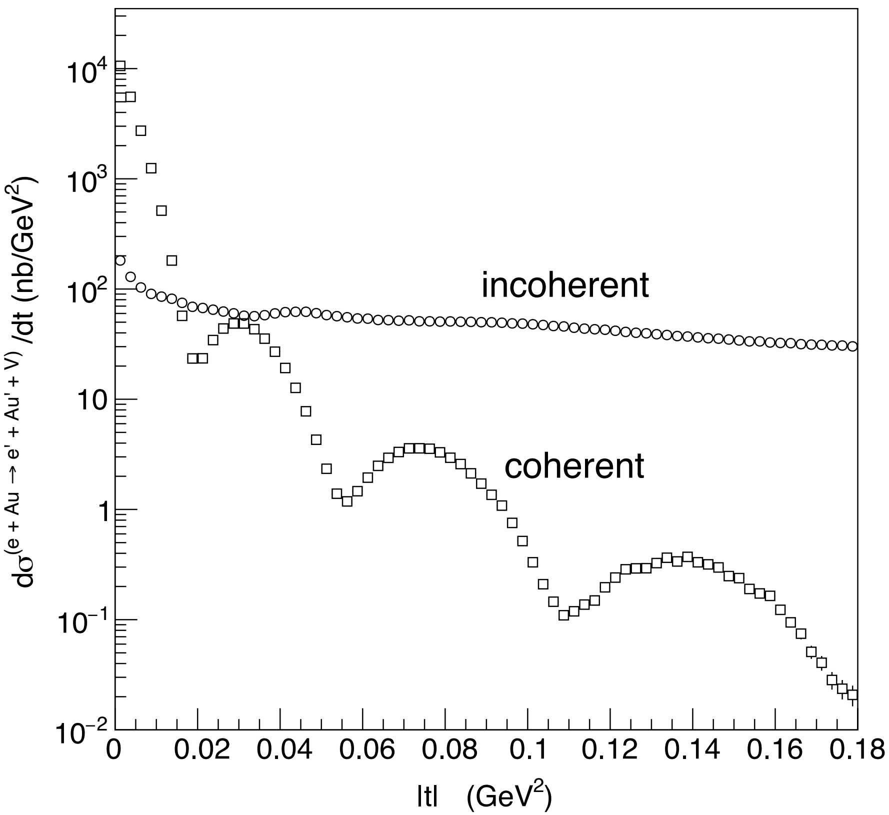
Parameters from https://physdiv.jlab.org/DetectorMatrix/ as of Mar 25, 2020

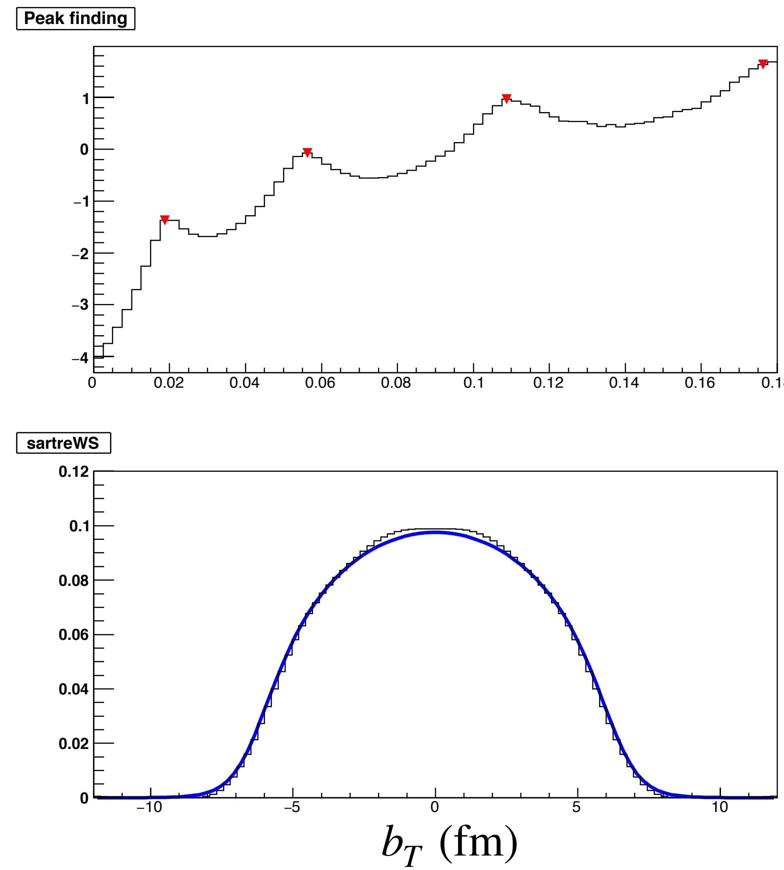
scattered e': $$\frac{\sigma_{p_T}}{p_T}(\%) = 0.1\ p_T \oplus 0.5$$

$$-3.5 < \eta < -2$$

Using bNonSat, no skewness and real part corrections

Baseline

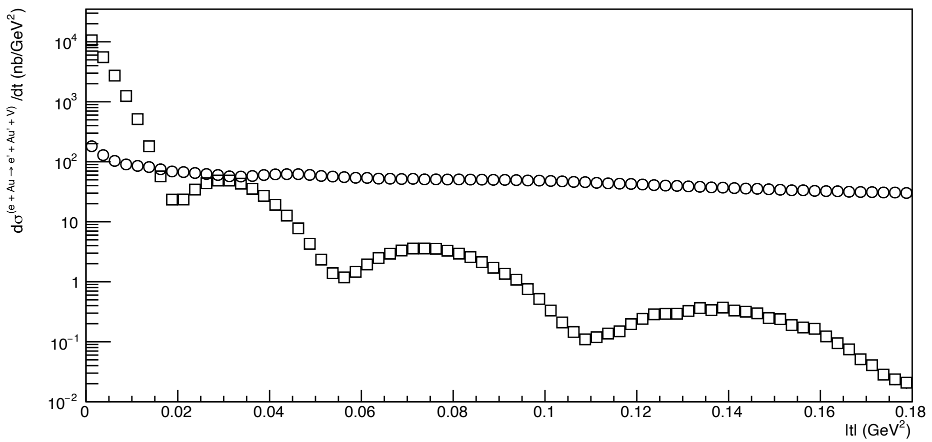


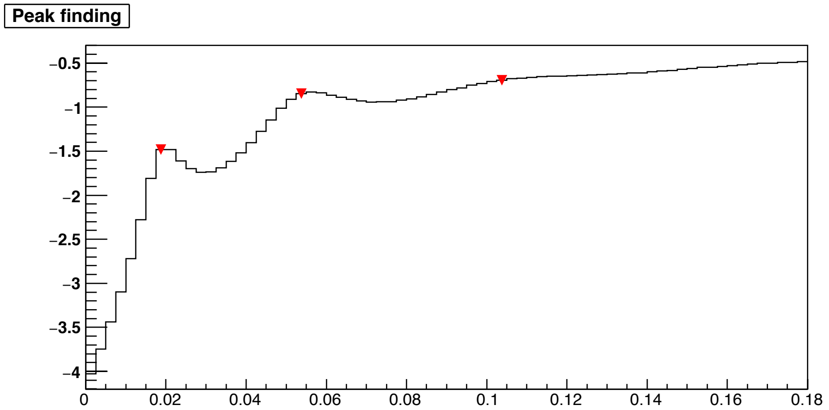


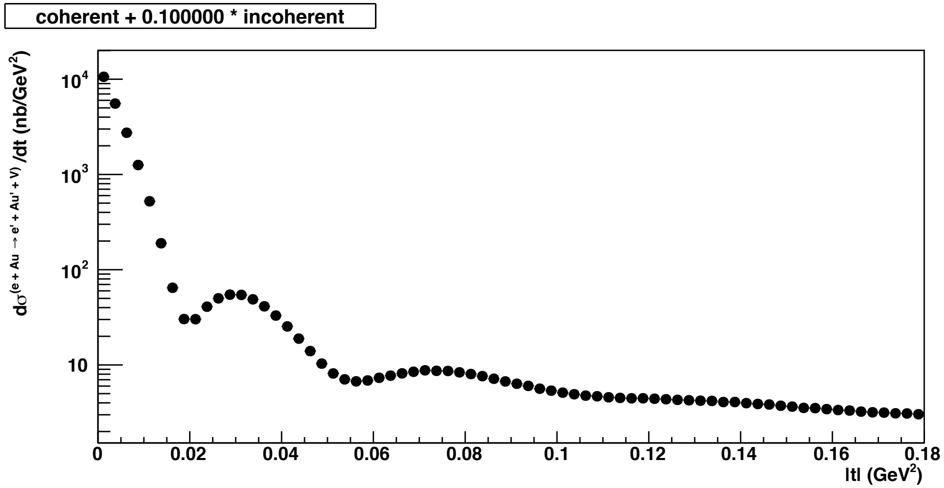
Here only the coherent curve is used. In the real world we need to suppress the incoherent events. Question is by how much.

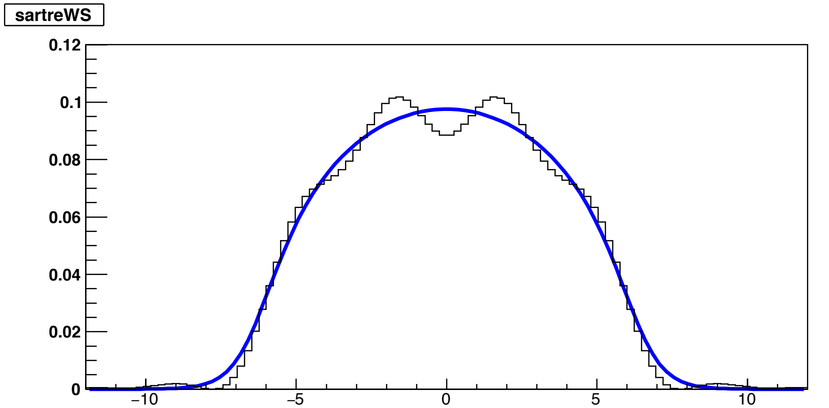
Method: mix coherent with fraction of incoherent (non-detected leftover) and study effect.

Suppression = 0.1



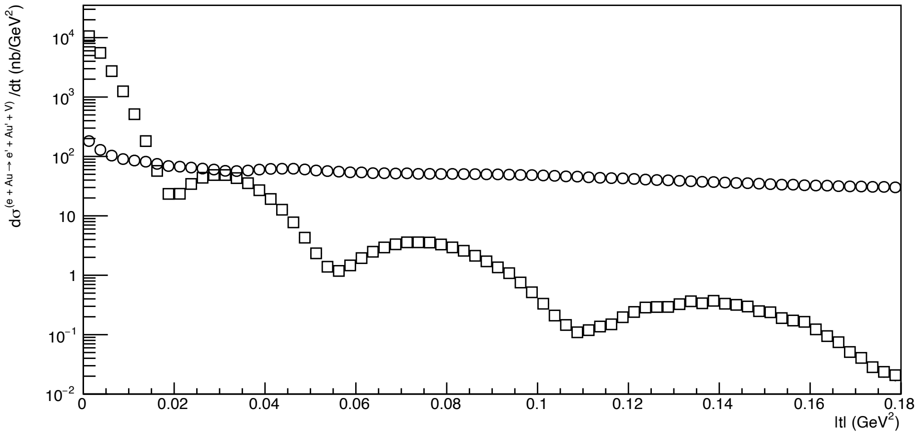


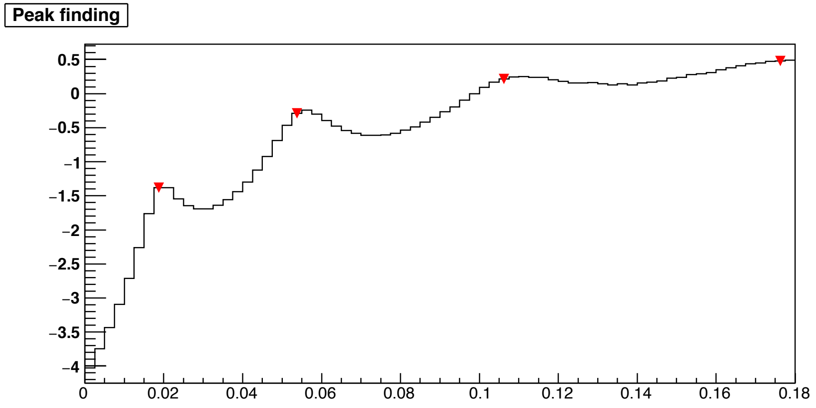


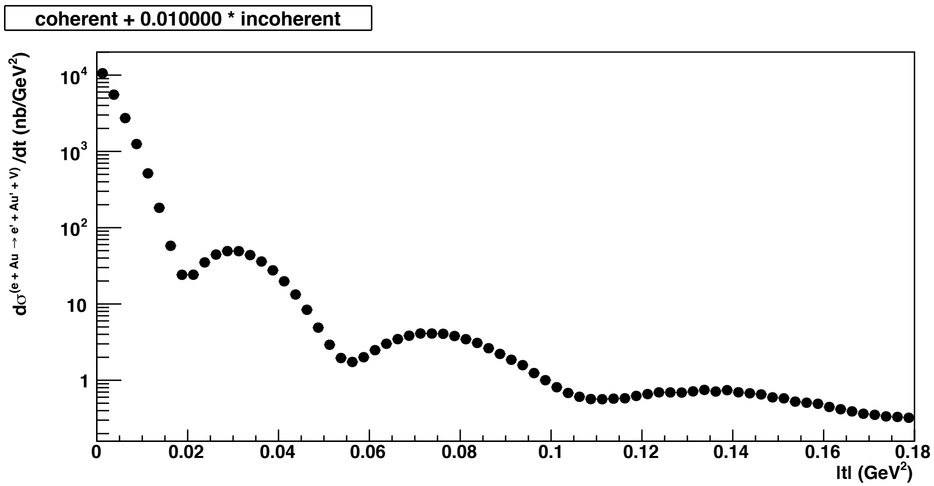


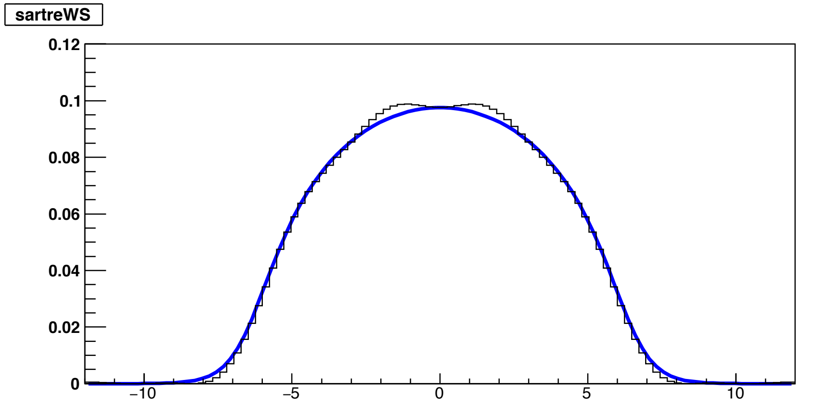
Not surprising - this fails

Suppression = 0.01



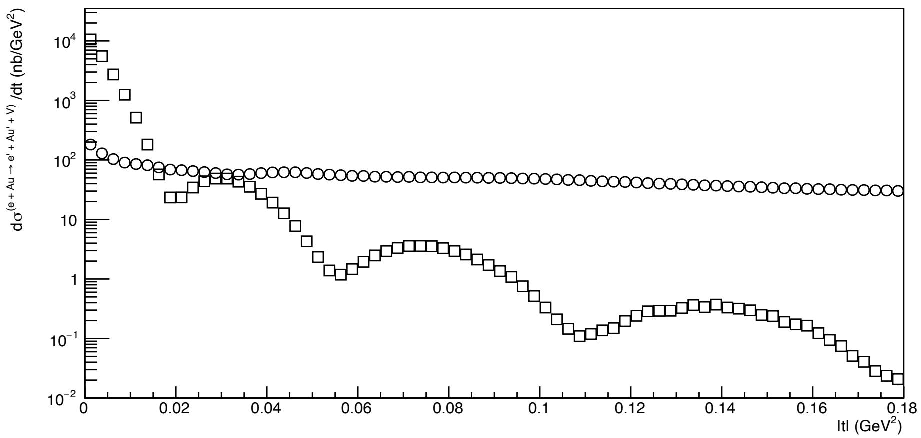


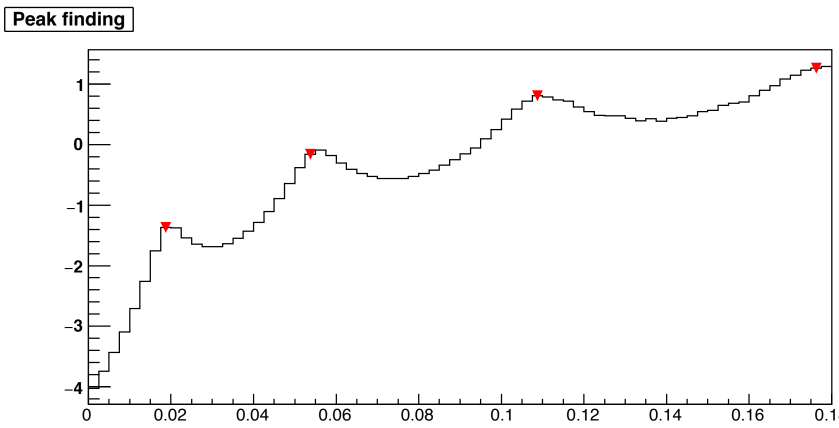


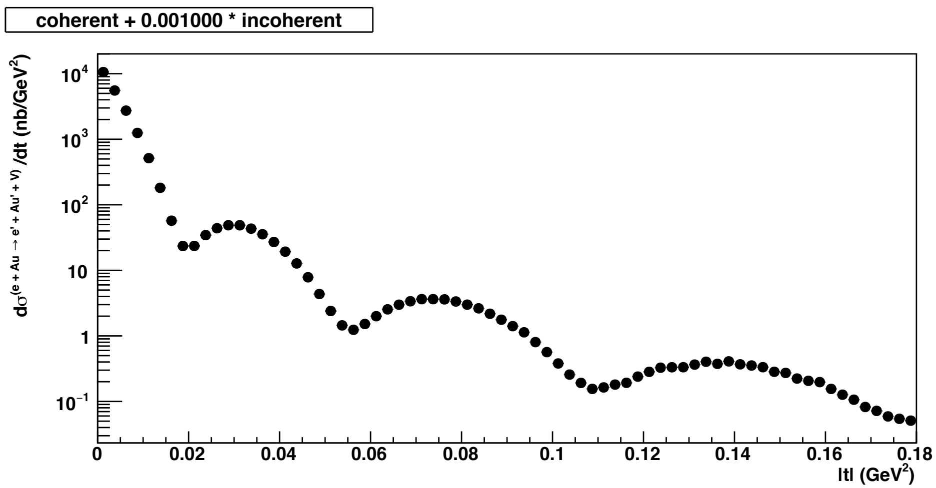


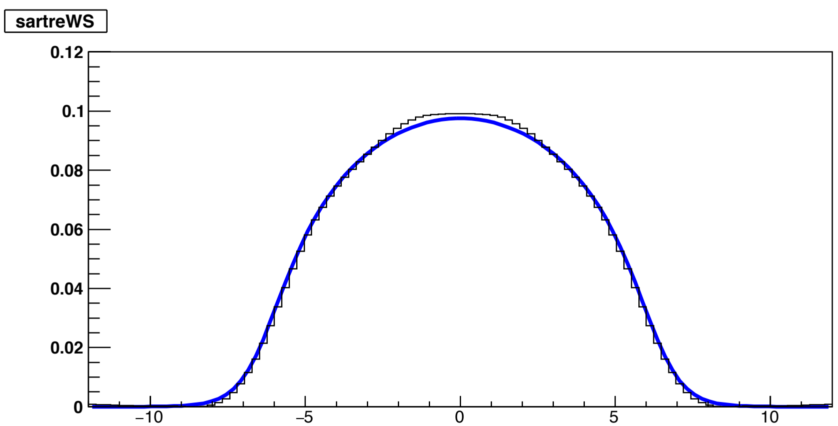
Still not good - effects larger t and hence smaller b_T

Suppression = 0.001



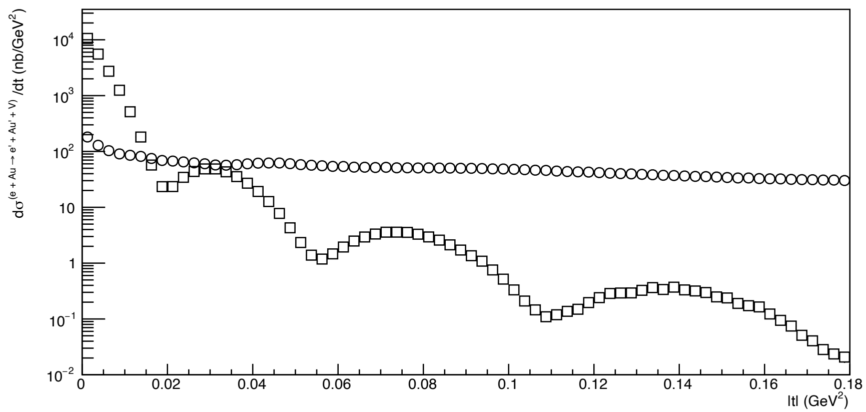


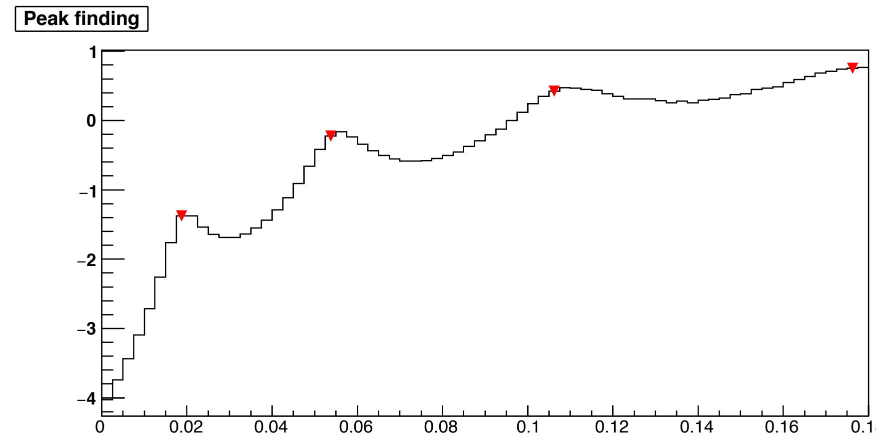


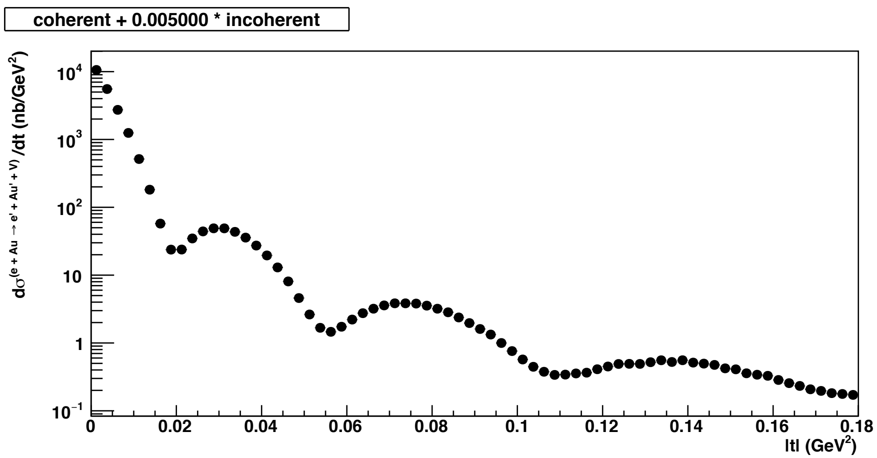


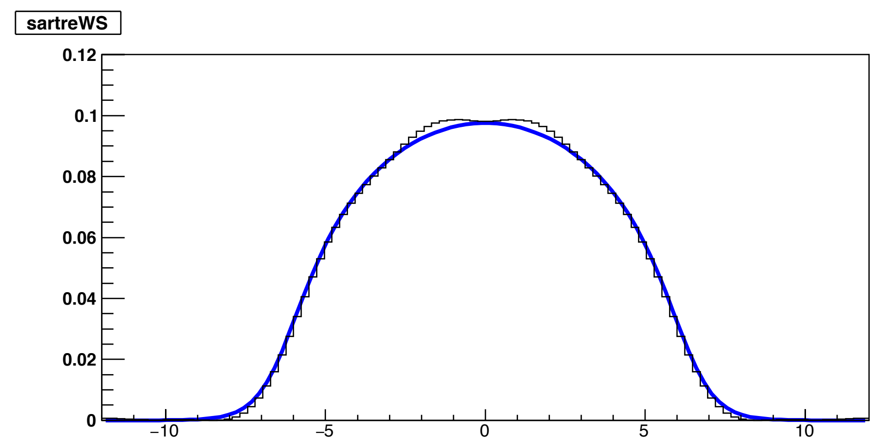
Factor 1000 suppression does it

Suppression = 0.005



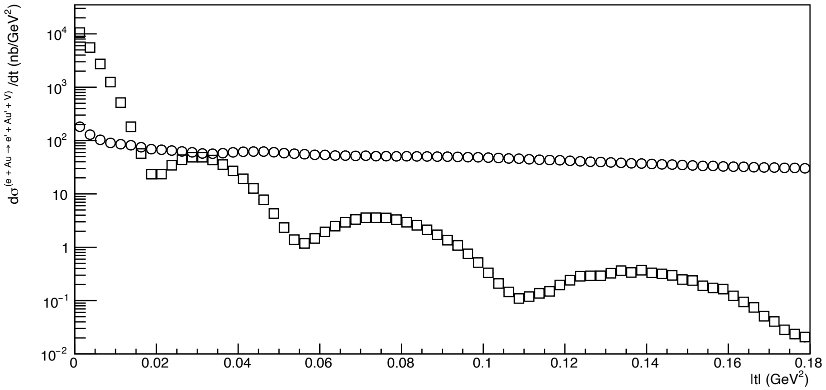


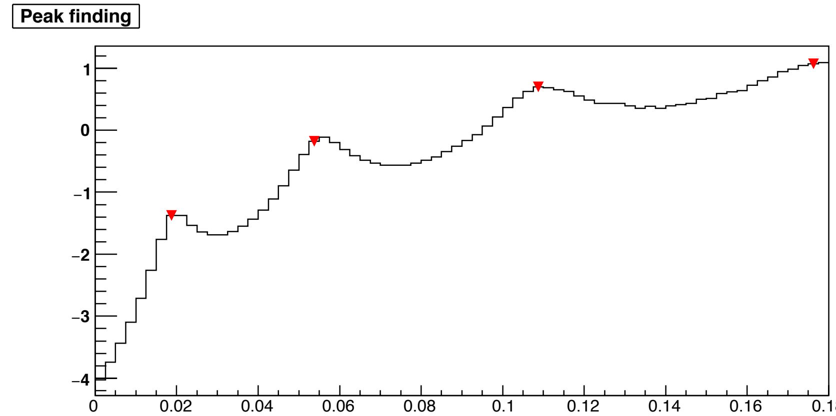


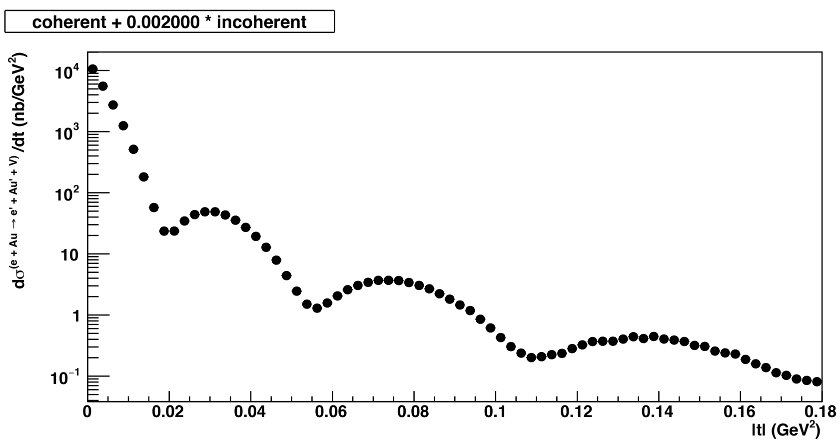


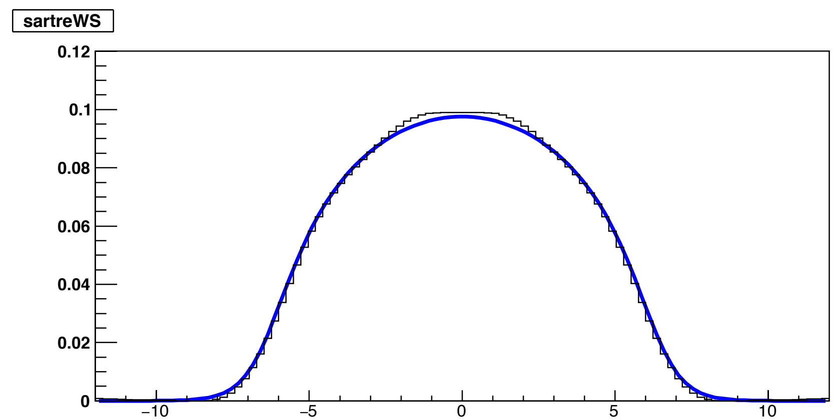
Factor 200 suppression close but still shows structure at $b_T \sim 0$ where there's none

Suppression = 0.002



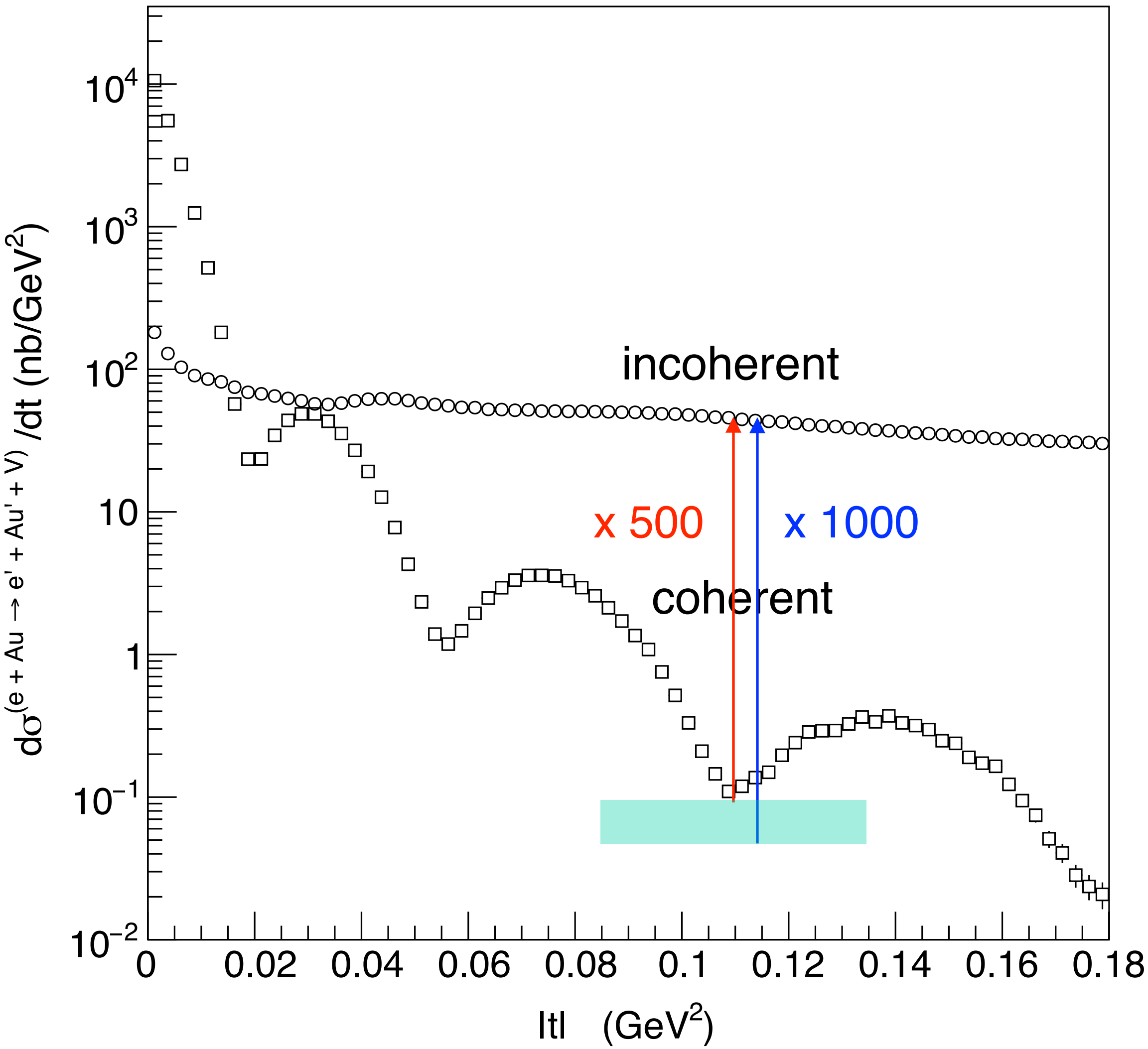






Factor 500 suppression seems just OK

Why Factor 500-1000?



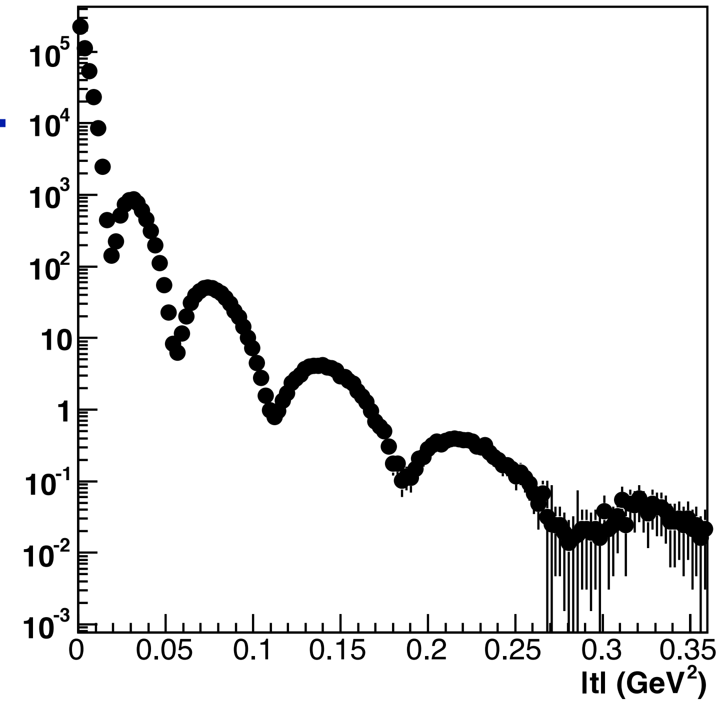
Determining the required suppression factor is a bit subjective but there's a simple explanation for factor 500-1000:

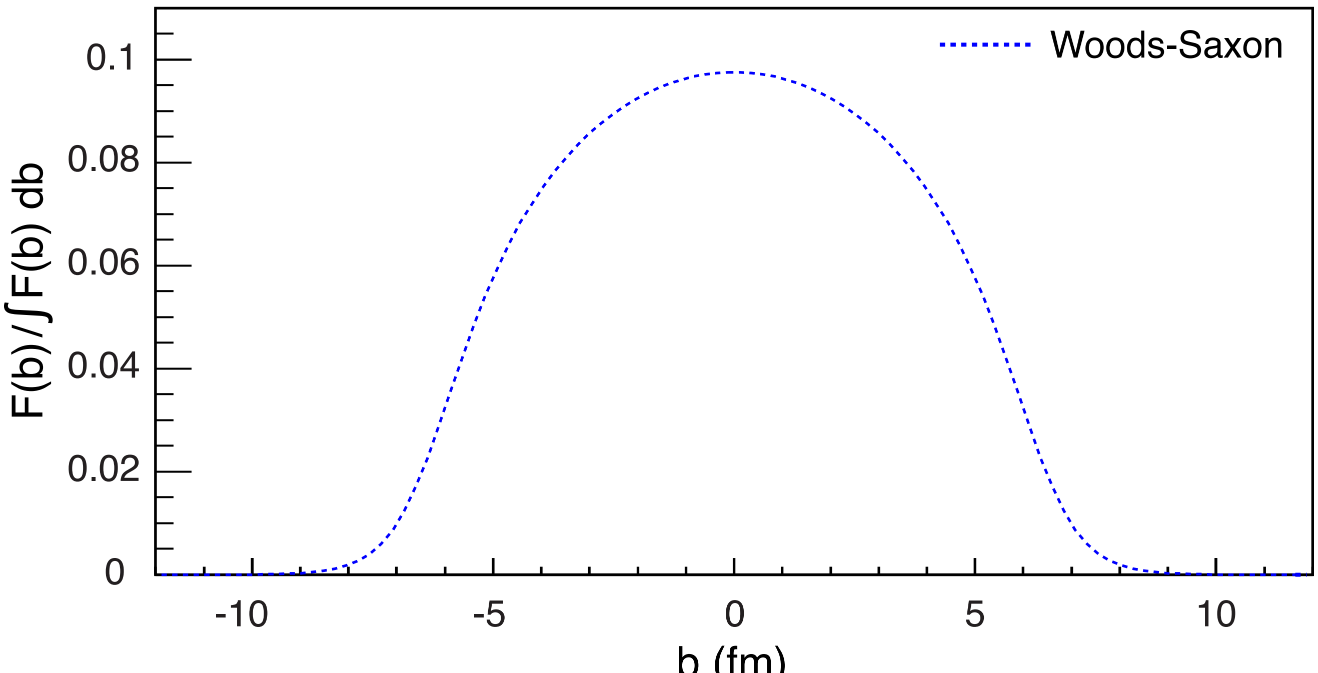
500 is essentially the ratio of incoherent/coherent at the 3rd minima that is essential for resolving the b≤0.5 fm range. Factor 1000 ensures no distortion, 500 slight distortion but do not wash out the minimum

t-Range & 3rd Minima

Here ϕ bNonSat:

- No saturation effects expected
- In ideal world: should get original Woods-Saxon back

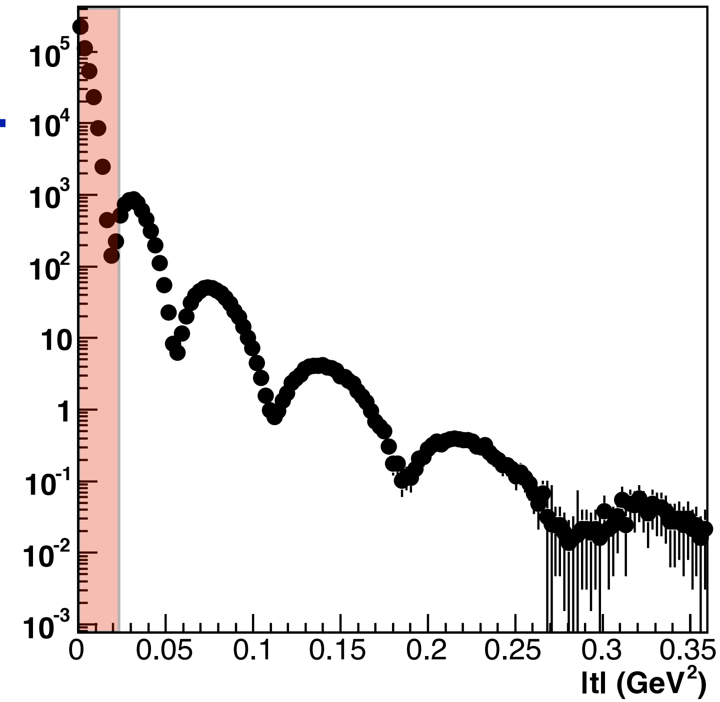


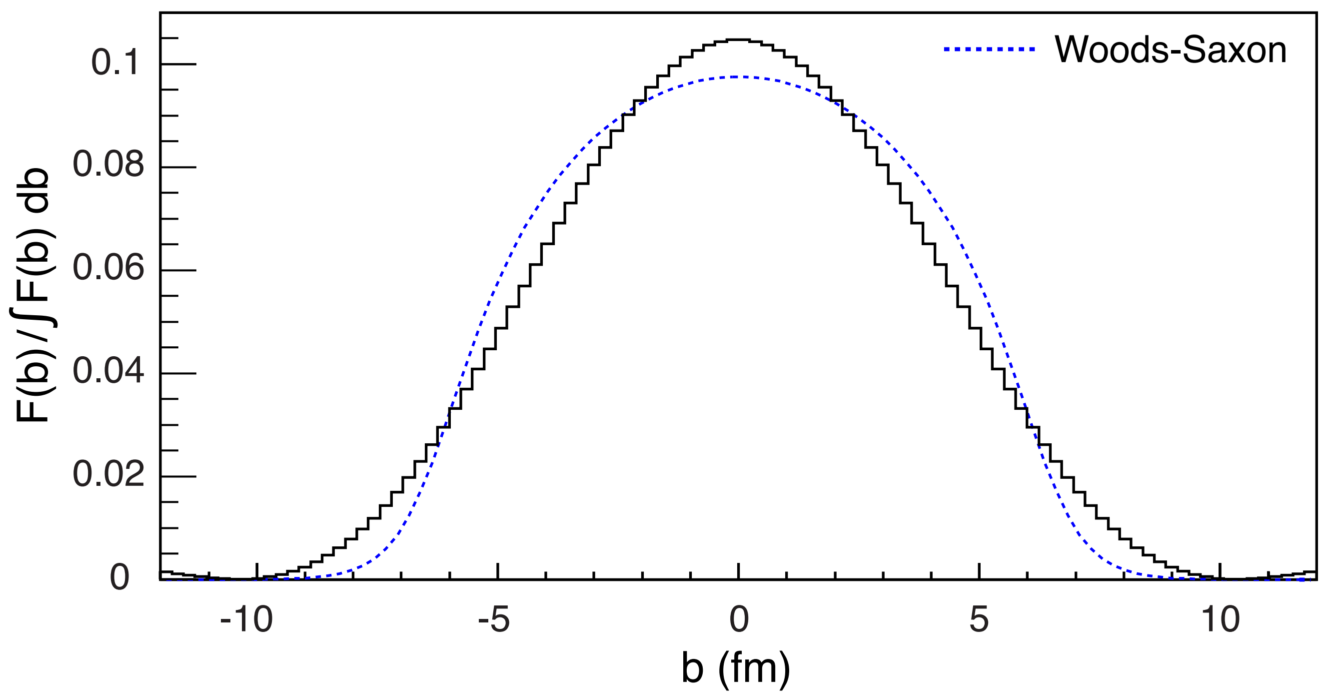


t-Range & 3rd Minima

Here ϕ bNonSat:

- No saturation effects expected
- In ideal world: should get original Woods-Saxon back





t-Range & 3rd Minima

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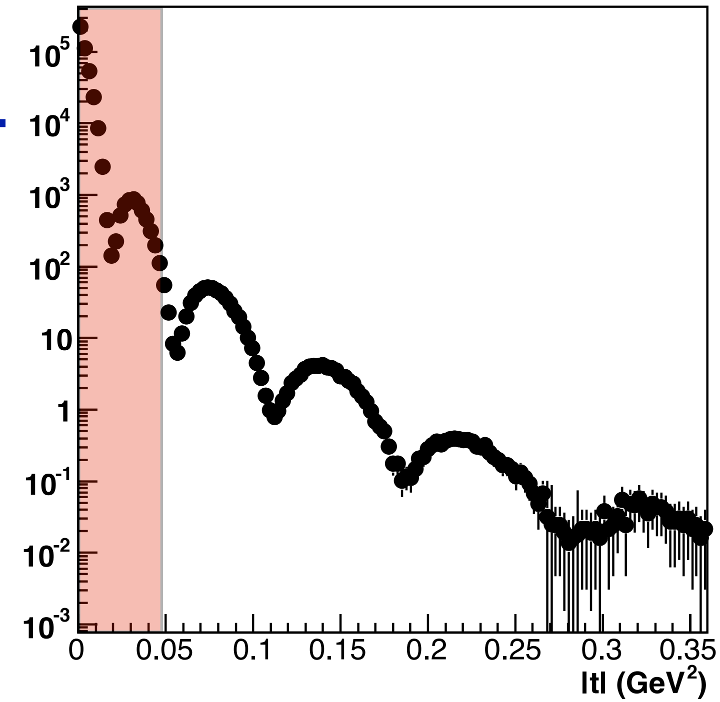

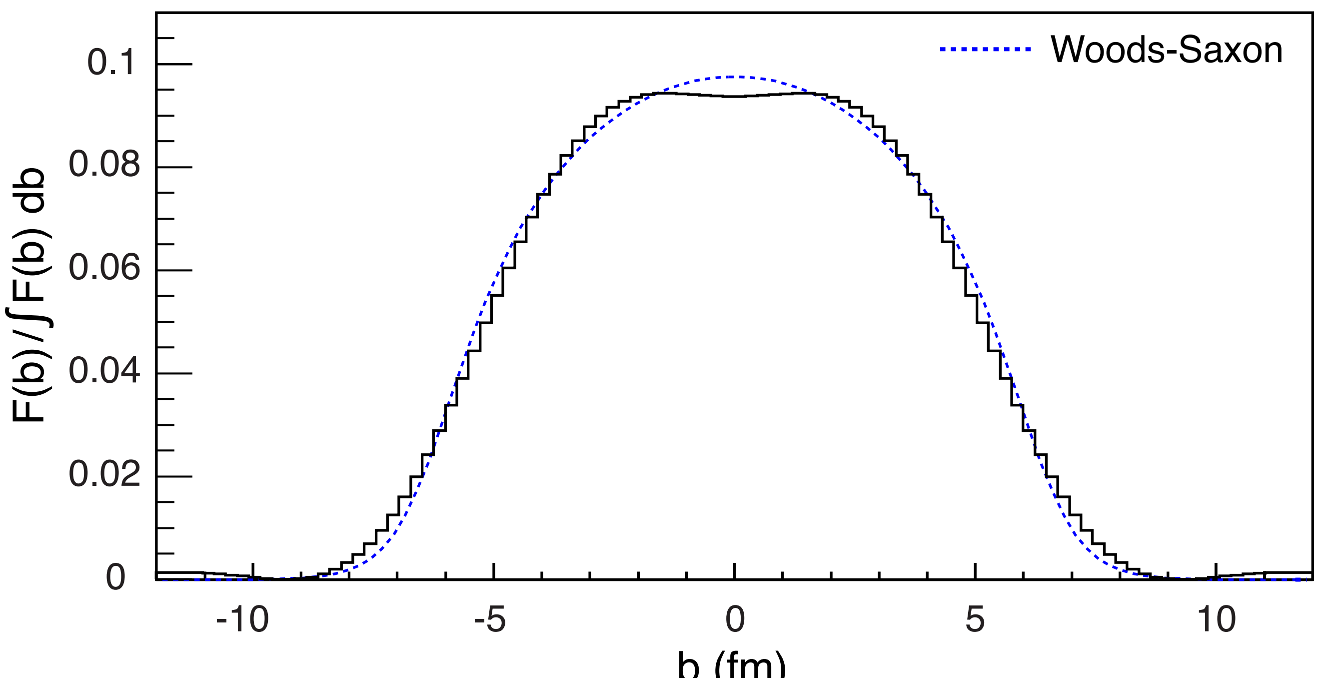

t-Range & 3rd Minima

Here ϕ bNonSat:

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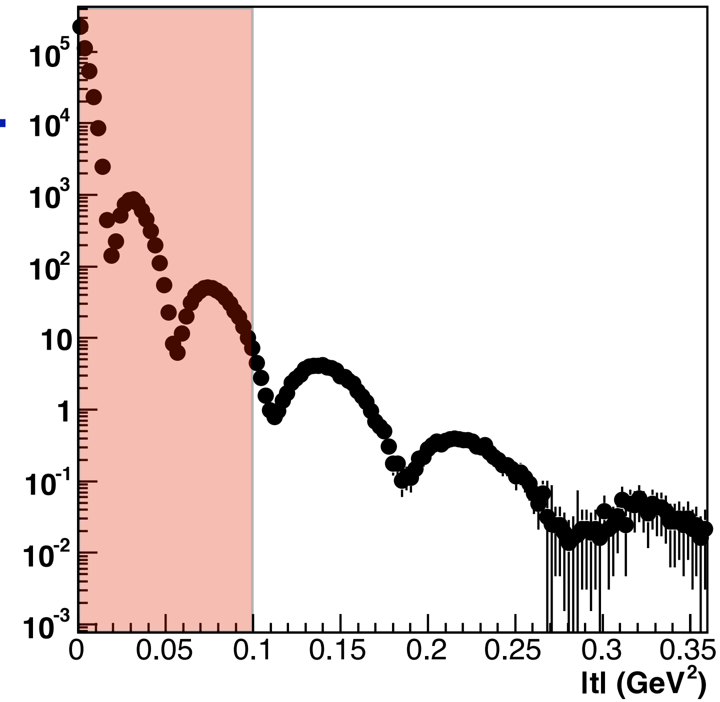

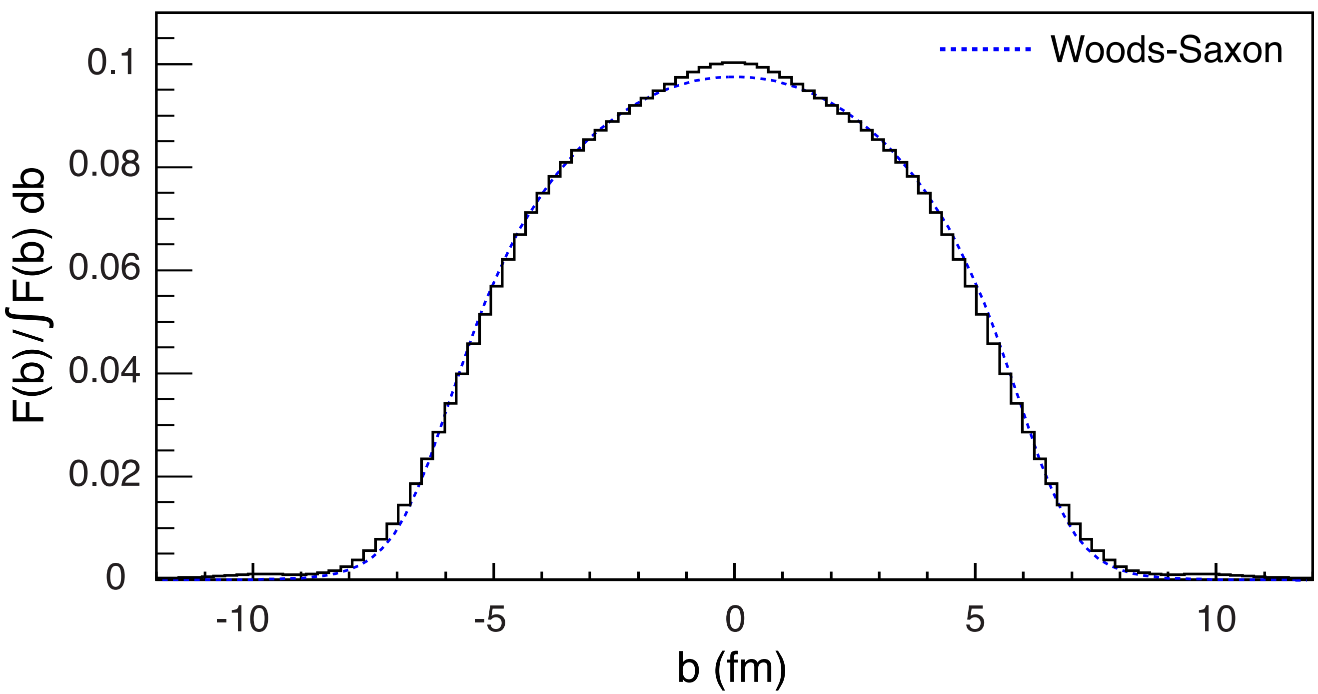

t-Range & 3rd Minima

Here ϕ bNonSat:

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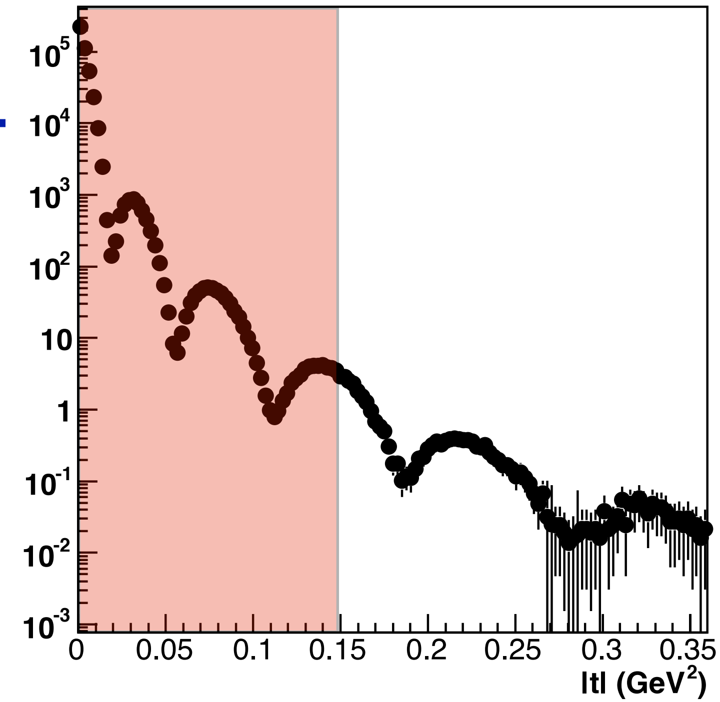
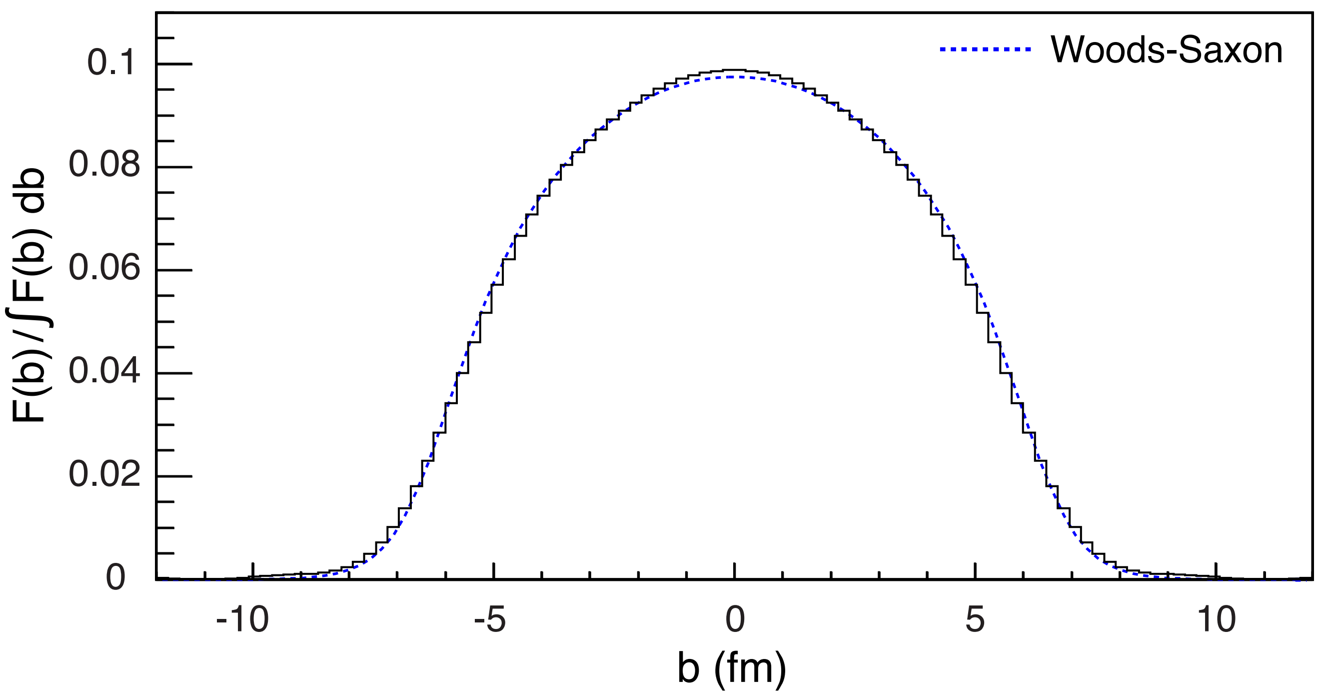
- In ideal world: should get original Woods-Saxon back

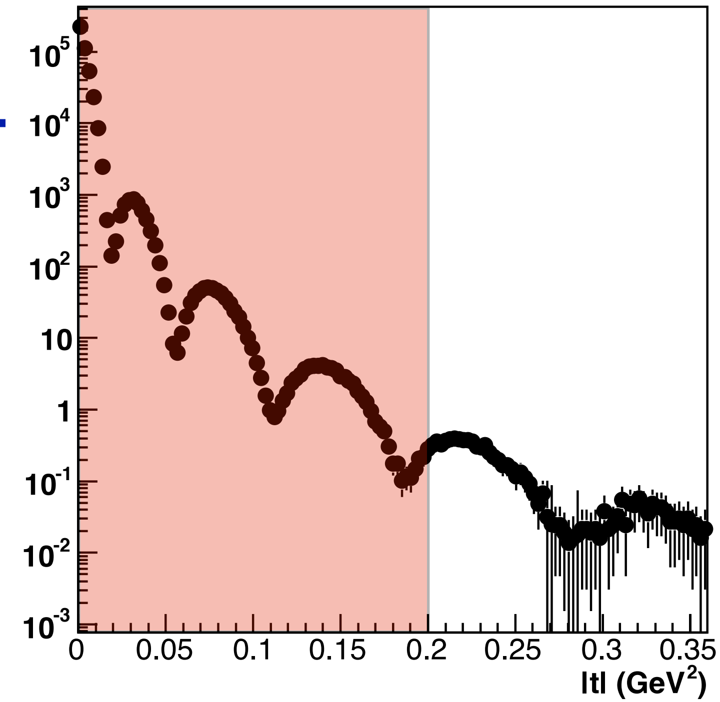


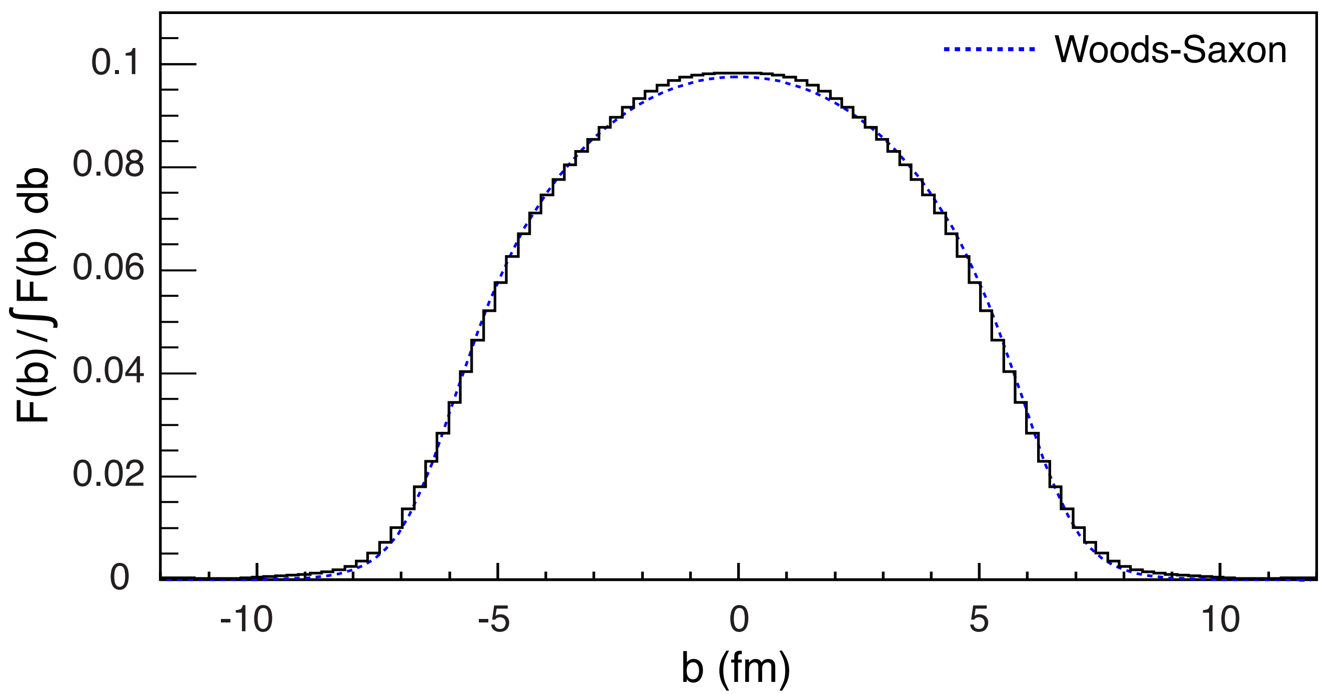


t-Range & 3rd Minima

Here ϕ bNonSat:

- No saturation effects expected
- In ideal world: should get original Woods-Saxon back





t-Range & 3rd Minima

Here ϕ bNonSat:

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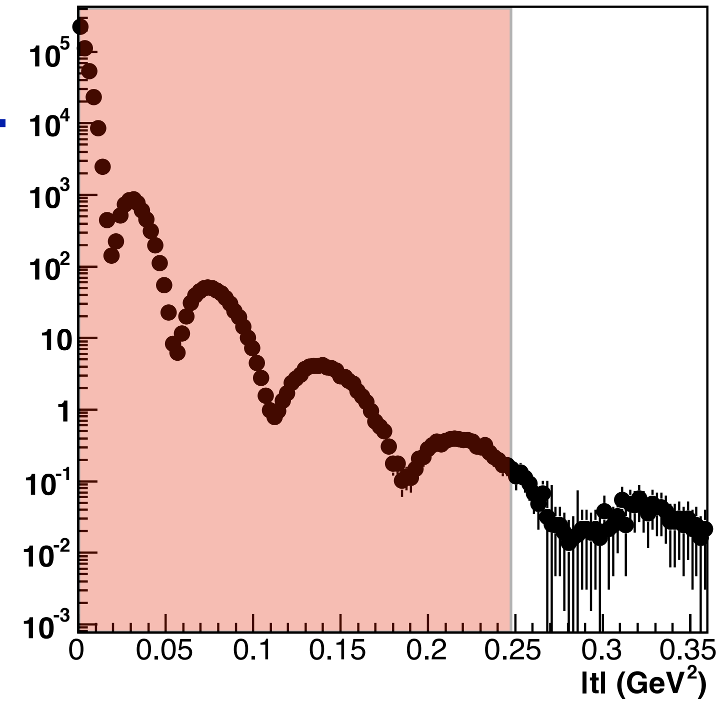
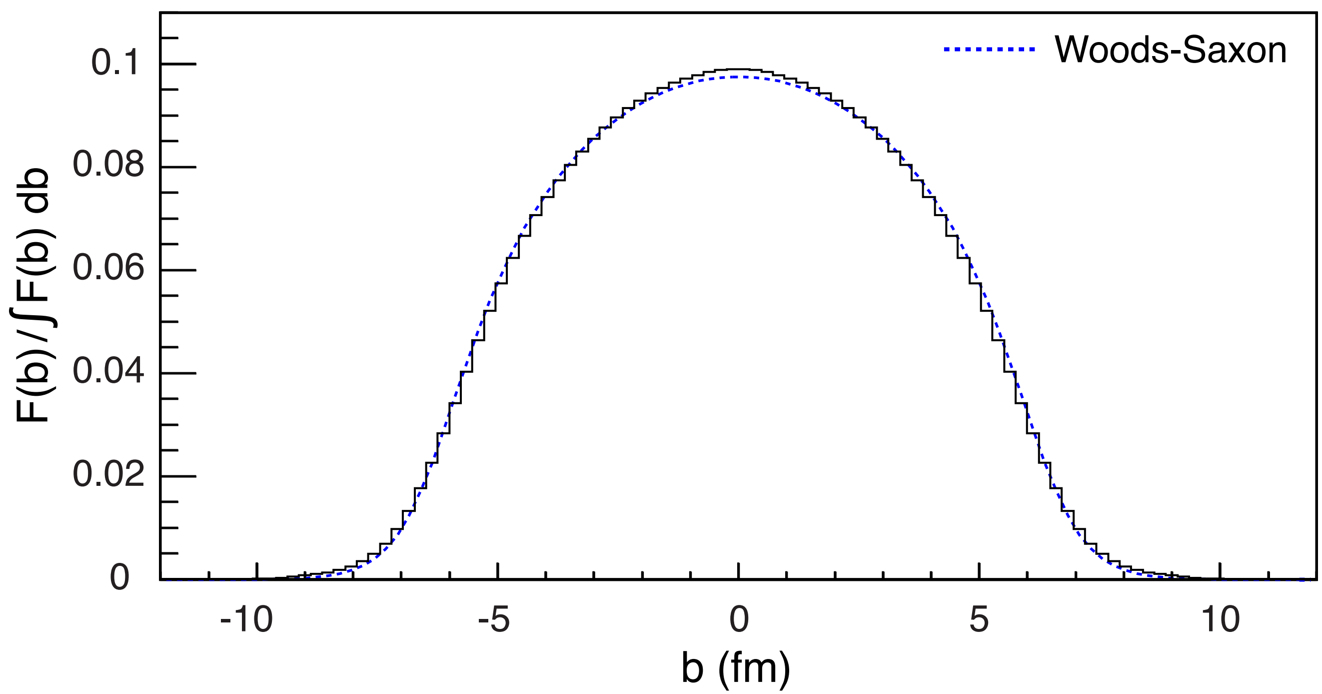
- In ideal world: should get original Woods-Saxon back

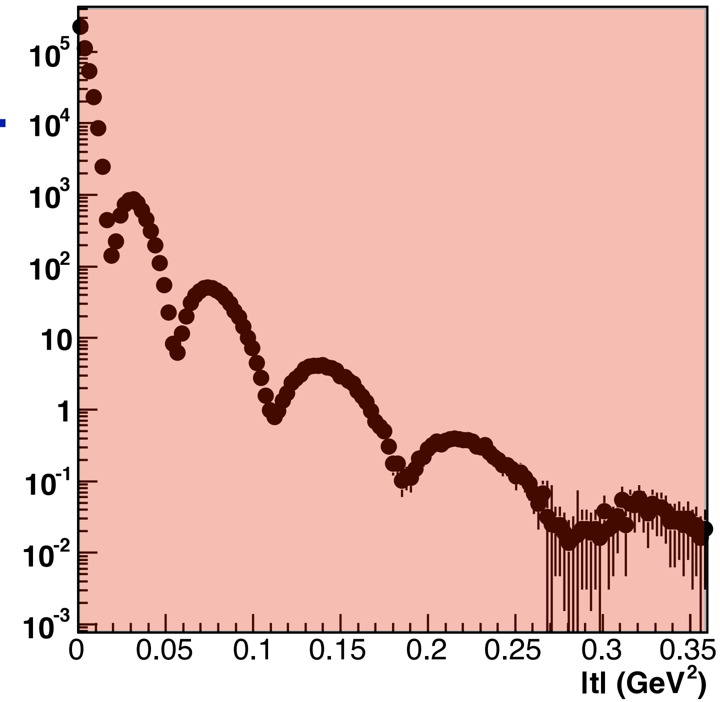


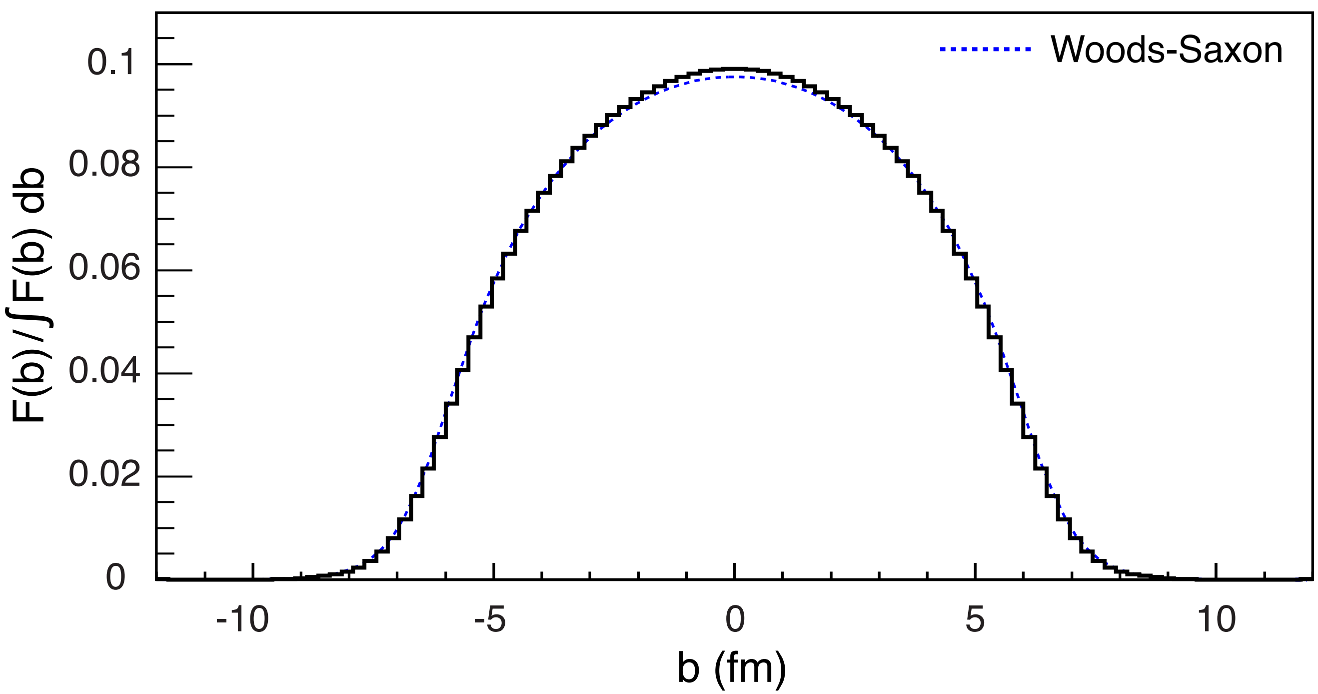


t-Range & 3rd Minima

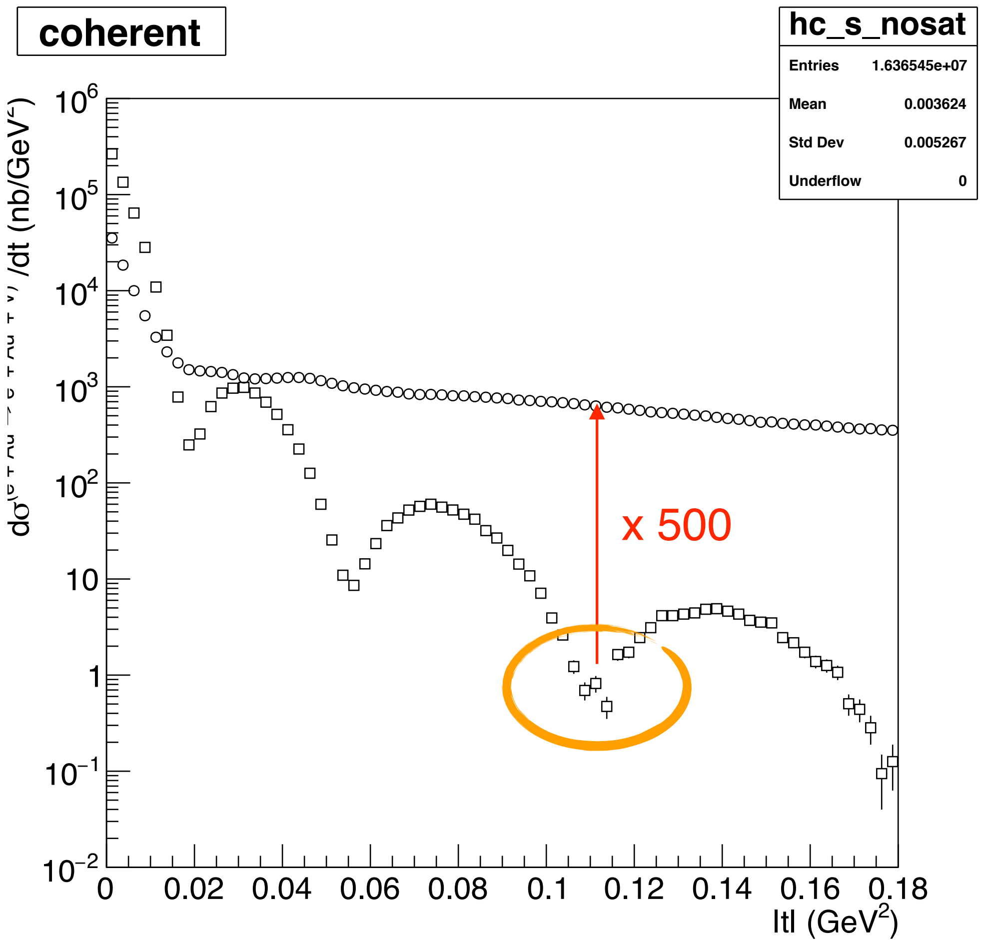
Here ϕ bNonSat:

- No saturation effects expected
- In ideal world: should get original Woods-Saxon back





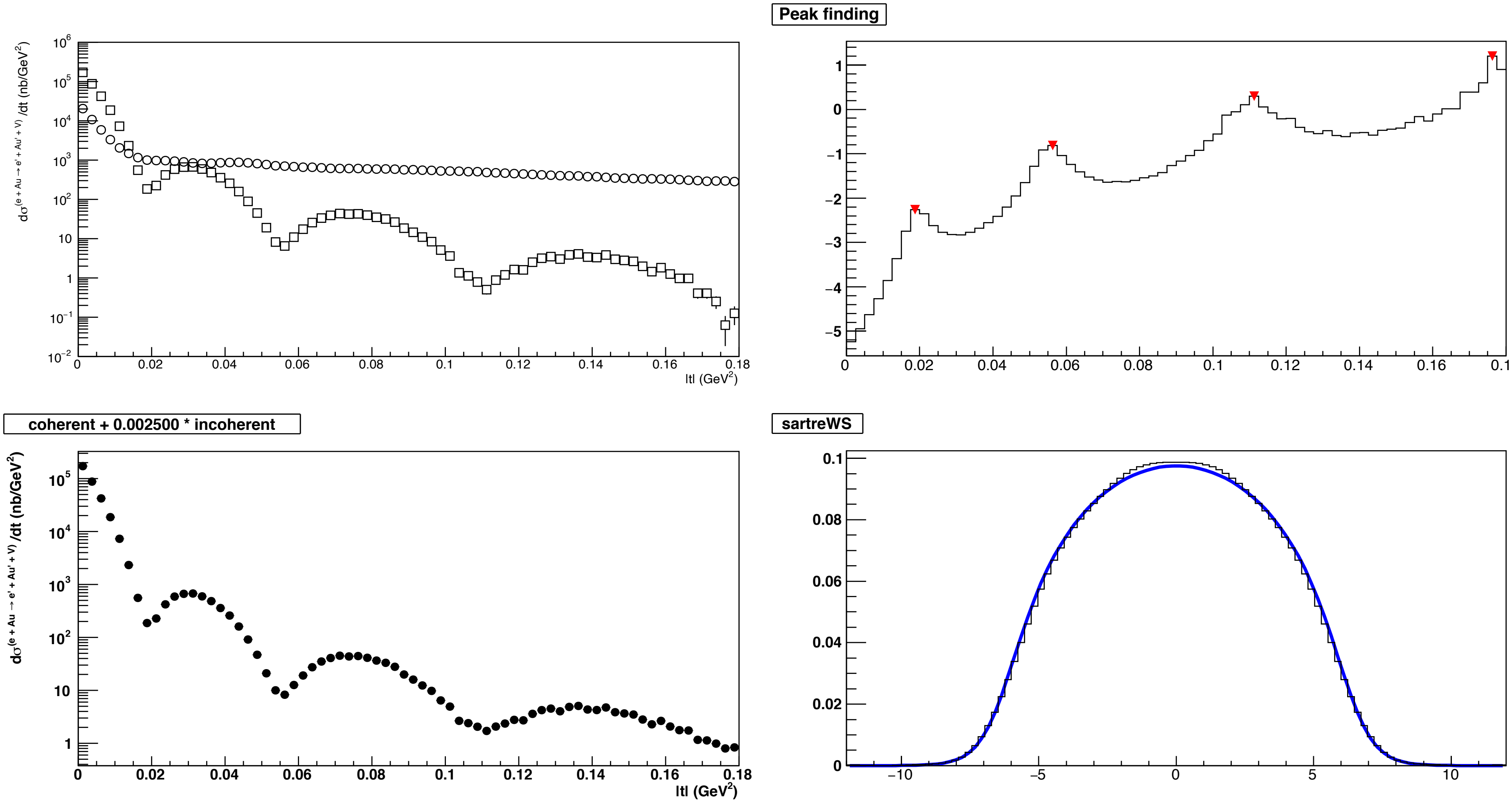
What about ϕ then?



ϕ is a tic less affected by resolution effects than the J/ψ, making the minima somewhat steeper. To retain this advantage we would need more than 500-1000 but should be still OK.

Note: the incoherent cross-section goes to 0 as $t \to 0$. Sartre does that correctly. The reason that this is not the case here (and elsewhere in this study) is that at small t the smearing, δt is largest filling up the drop.

Suppression = 0.0025 for ϕ

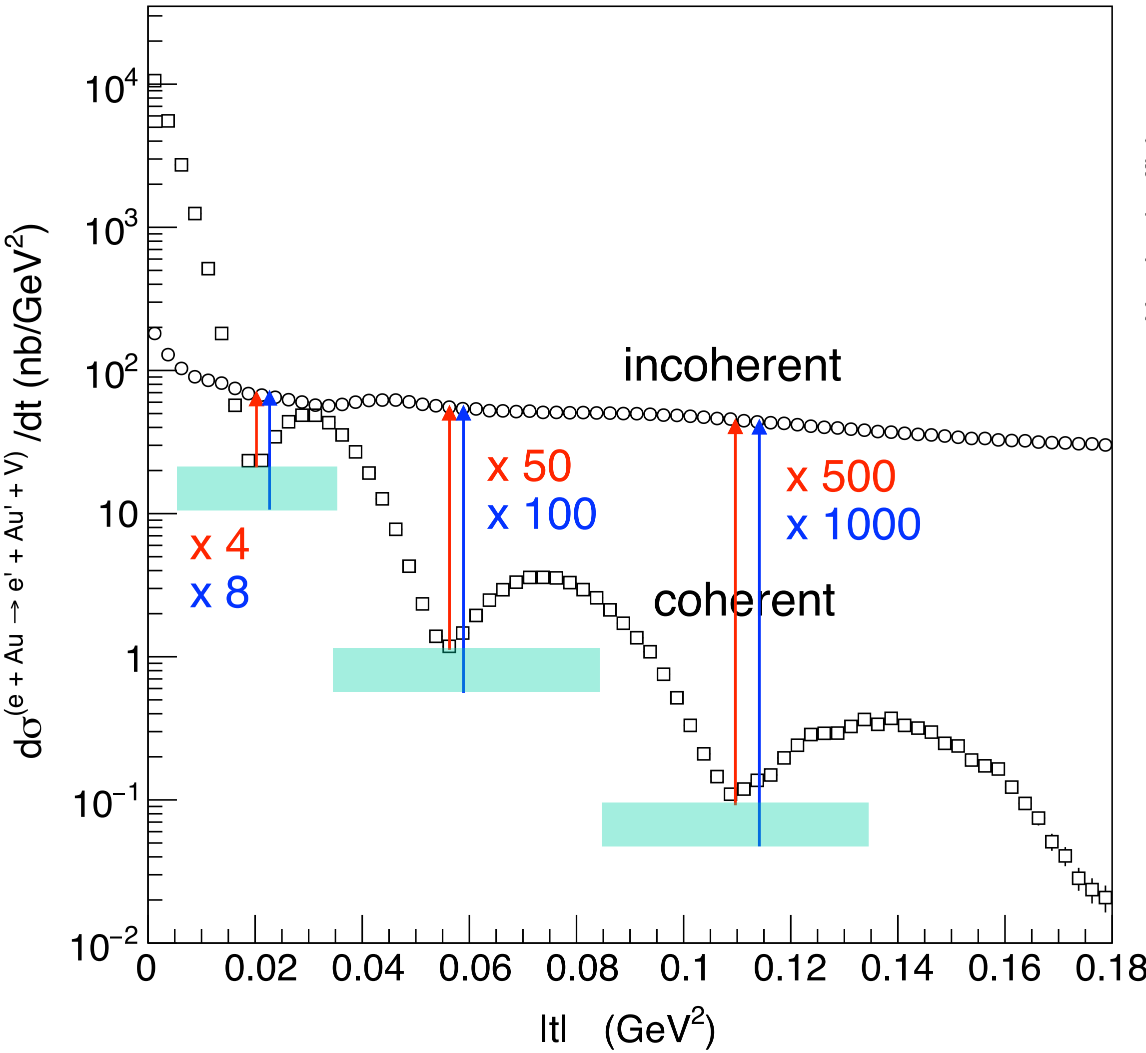


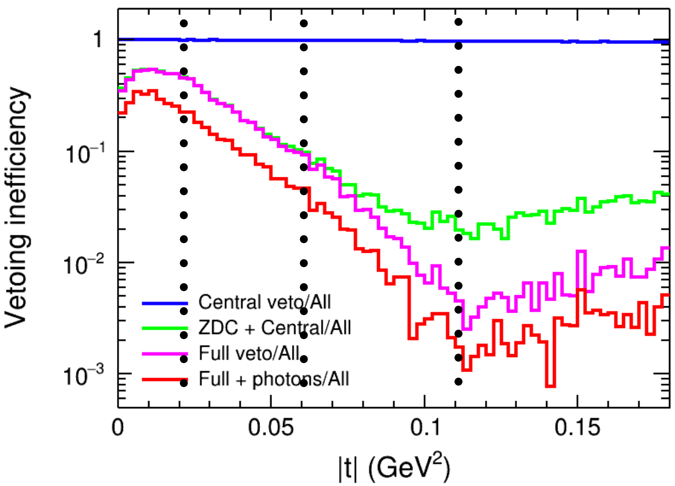
It is! As expected 500 is pretty good suppression does it

Summary (I)

- The EIC needs to be able to suppress incoherent diffractive interactions by a factor 500-1000 to extract the (gluon) source distribution of Au (Pb).
- Since incoherent is quite important in its own rate it might be better to say: incoherent events need to be tagged with a 1:500 - 1:1000 purity
- This number reflects $\sigma_{\mathrm{incoherent}}/\sigma_{\mathrm{coherent}}$ (or exceeds slightly) at the 3rd minimum in $d\sigma_{\mathrm{coh}}/dt$
- It is to be expected that the suppression is t dependent. In this case the same argument as for the 3rd minimum holds for 1st and 2nd. Need suppression at least 2x below minima.

Summary (II)





Study by M. Baker et al. using BeAGLE but at a different energy (10+40 GeV, ePb)
Need this study for 18+110 GeV → tagging group

The End