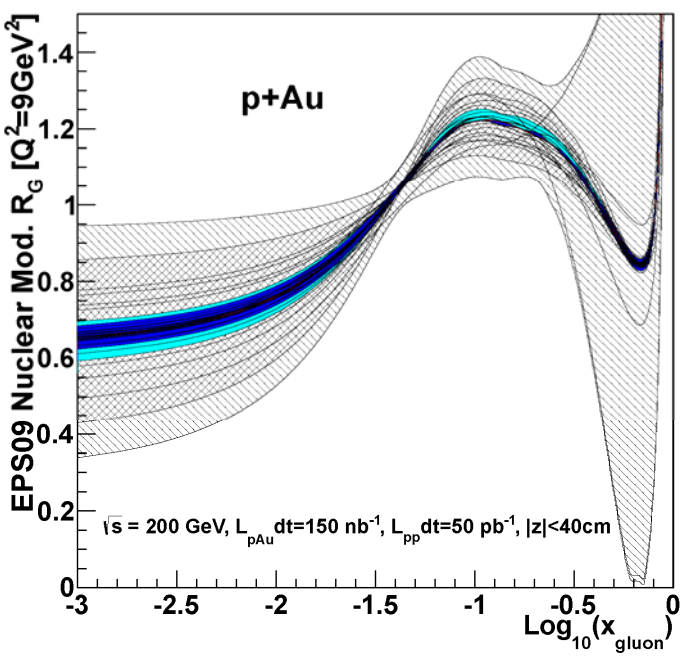
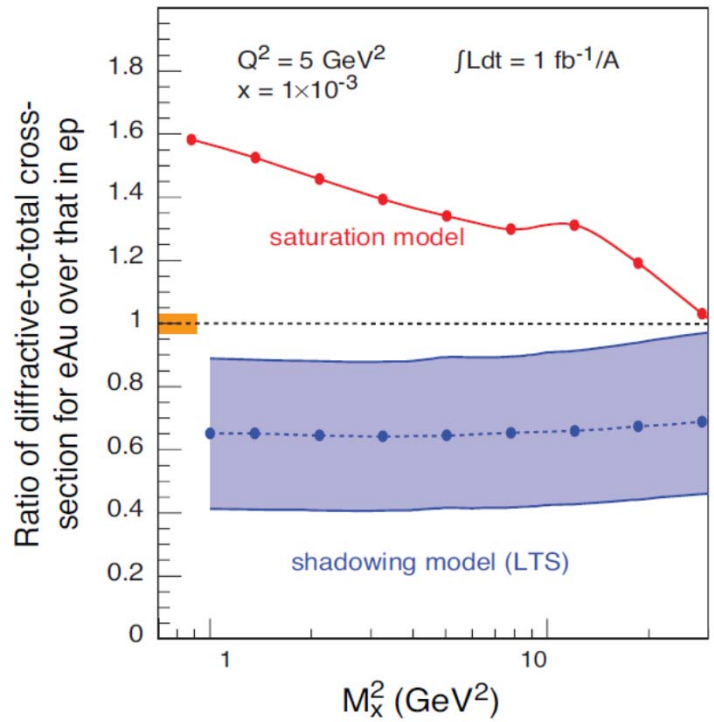
What will we know by 2022?

- Both STAR and PHENIX will have a prompt photon measurement "nailed".

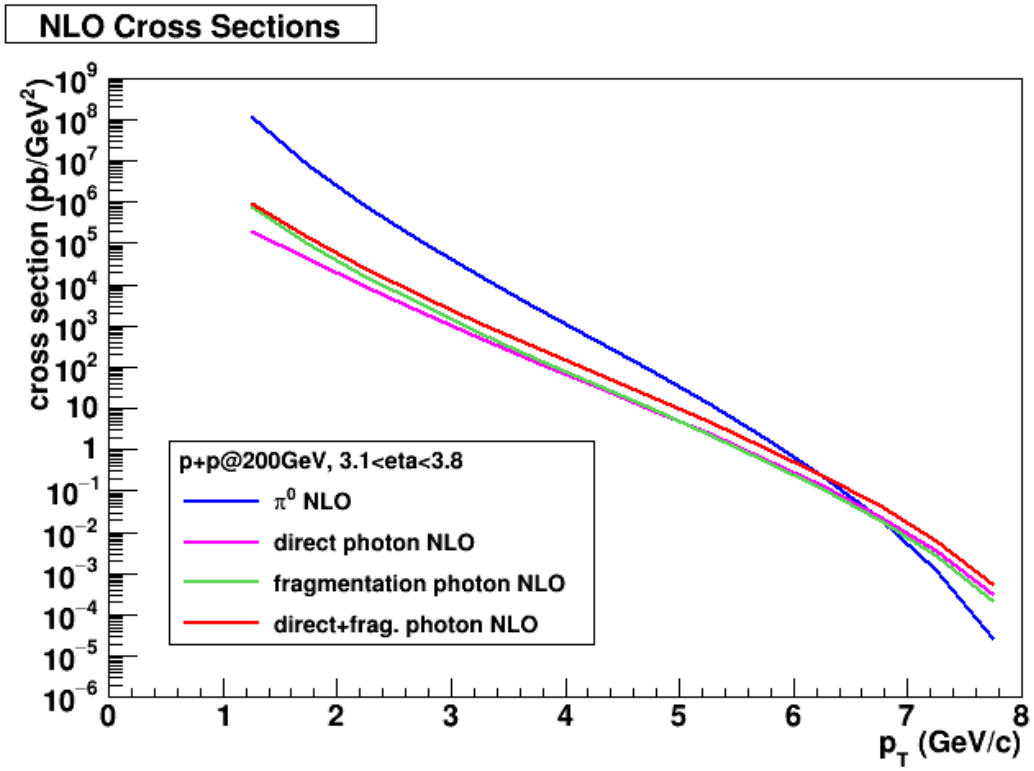


The EIC will make definitive measurements…



So what can RHIC add on the way to the EIC?

Prompt Photon, Photon + Jet



NLO cross sections from Werner circa 2013 (MPC-EX Proposal)

Not the full acceptance we might want, but it's the numbers I have on hand….

Good enough for a start…

Projected p+Au Statistics (Photons)

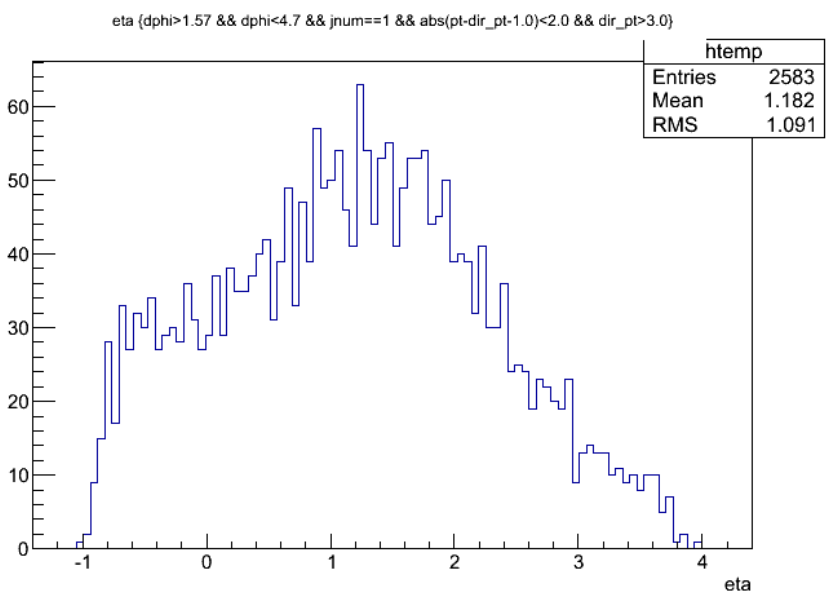
- Using the luminosity assumptions from CAD for p+Au:
  - 10 weeks max/min/avg = 3.4/1.2/2.3 pb^{-1}
  - 70% detector efficiency yields 1.6pb^{-1} recorded

- 2.7 x 10^6 prompt photons (direct + fragmentation) with p_T>3.0 GeV/c

p_T (GeV/c)	π^0	Photons (direct + frag.)
1.25	7.0 x10^{10}	5.9 x10^8
1.75	6.3 x10^9	1.1 x10^8
2.25	8.3 x10^8	2.6 x10^7
2.75	1.4 x10^8	6.8 x10^6
3.25	2.5 x10^7	1.9 x10^6
3.75	4.9 x10^6	5.4 x10^5
4.25	9.8 x10^5	1.6 x10^5
4.75	1.9 x10^5	4.5 x10^4
5.25	3.5 x10^4	1.2 x10^4
5.75	5.6 x10^3	3.2 x10^3
6.25	7.3 x10^2	7.4 x10^2
6.75	7.1 x10^1	1.2 x10^2

Photon+Jet (I)

- Need to capture the jet in acceptance
  - Lowest *x* probed when jet is also in forward acceptance.
- Quick study….
  - Pythia + FastJet, assume jets in $-1 < \eta < 4$



Requiring a jet in the acceptance reduces the statistics by a factor of 6.6.

~2.0 x 10^5 <u>direct</u> photon + jet events

Photon + Jet (II)

Jet Acceptance	Fraction of events with photon pT>3.0	Fraction of All (-1<η<4)	<log(x_2)>
All (-1<η<4)	0.15	1.0	-2.6
0<η<4	0.13	0.83	-2.6
1<η<4	0.086	0.56	-2.7
2<η<4	0.034	0.24	-2.9
3<η<4	0.0082	0.054	-3.0

Only a few thousand events remain (before efficiencies) in the highest pseudorapidity range.