

Jet-Triggers for Photons

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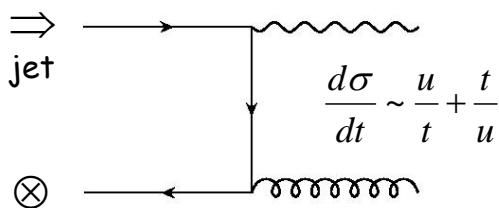
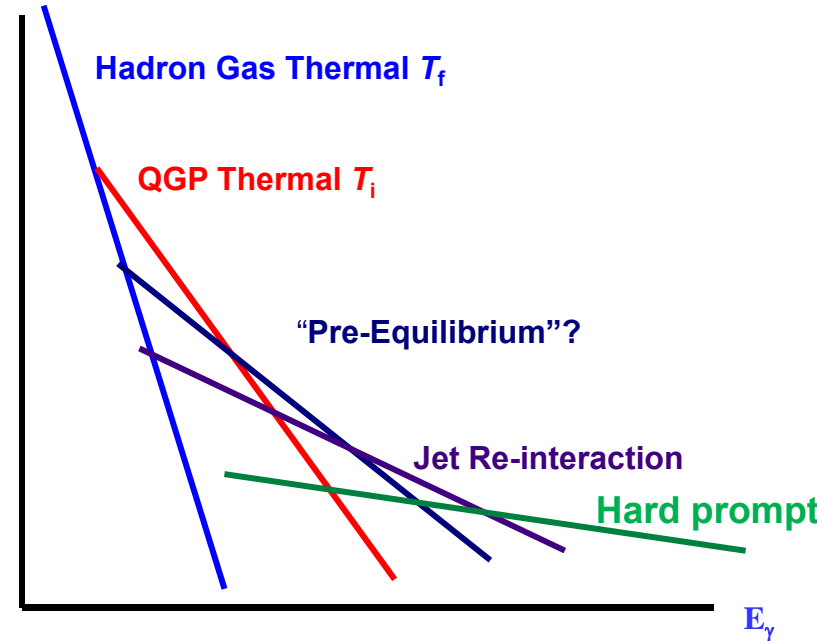


*Work in collaboration
with **Somnath De**
VECC and Texas A&M*

Workshop Jet Measurements at RHIC
Duke University, Durham NC, March 3, 2012

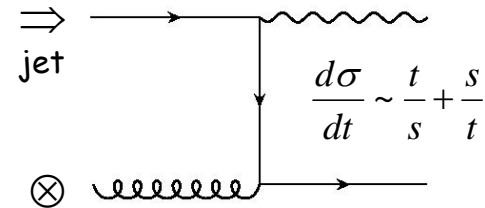
Identifying Photon Sources

- Thermal QGP, thermal hadron, prompt hard, bremsstrahlung, jet-medium.
- Jet-medium photons from elastic (back)scattering or bremsstrahlung.
- Elastic processes:



$$\vec{p}_\gamma \approx \vec{p}_{jet}$$

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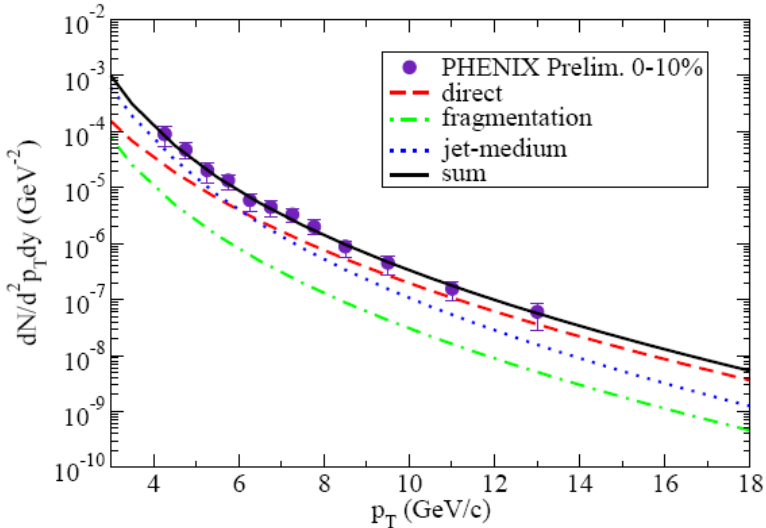


[RJF, Müller & Srivastava, PRL (2002)]

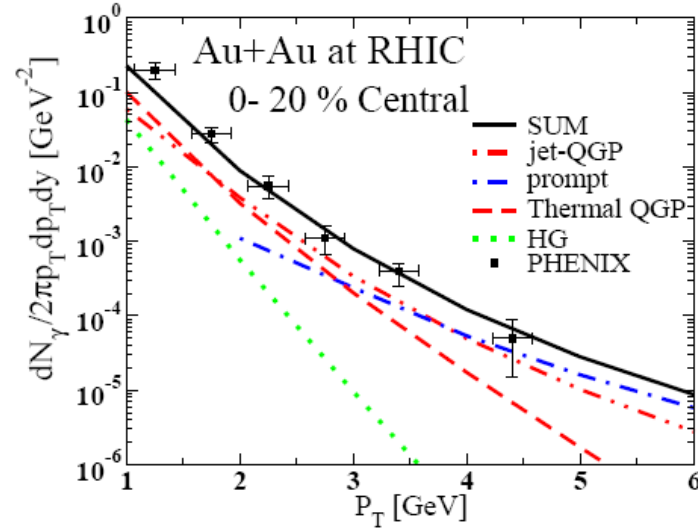
$$E_\gamma \frac{dN_\gamma}{d^3 p_\gamma} = \frac{\alpha \alpha_s}{8\pi^2} \int d^4 x \frac{2}{3} [f_q(p_\gamma) + f_q(p_\gamma)] T^2 \left(\ln \frac{4E_\gamma T}{m^2} + C \right)$$

How to Measure?

Inclusive yield and R_{AA} : hopeless



[Qin, Ruppert, Gale, Jeon & Moore (2009)]

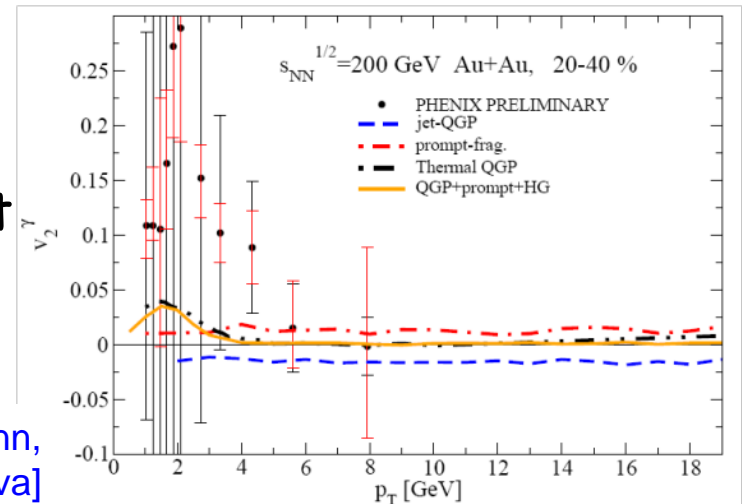


[Turbide, Gale, Frodermann & Heinz (2007)]

Negative v_2 for jet-medium photons!

[Turbide, Gale & RJF (2006)]

Expected signal too small for current resolution.

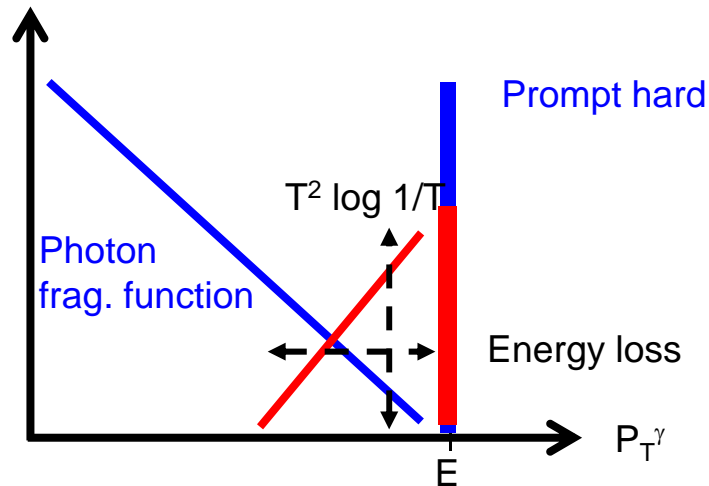


[Chatterjee, Frodermann, Heinz, Srivastava]



Jet-Triggered Photons

- Idealized picture: photons opposite a jet of fixed energy E in LO kinematics.

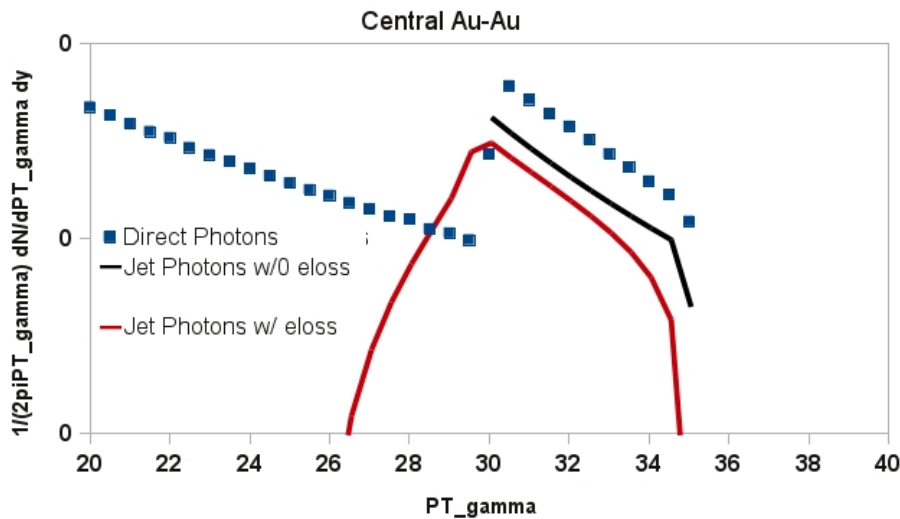


- Add jet-medium photons
- Add energy loss
- Important information stored in those photons
- Is nature that kind? Finite trigger windows, kinematics beyond LO, etc.

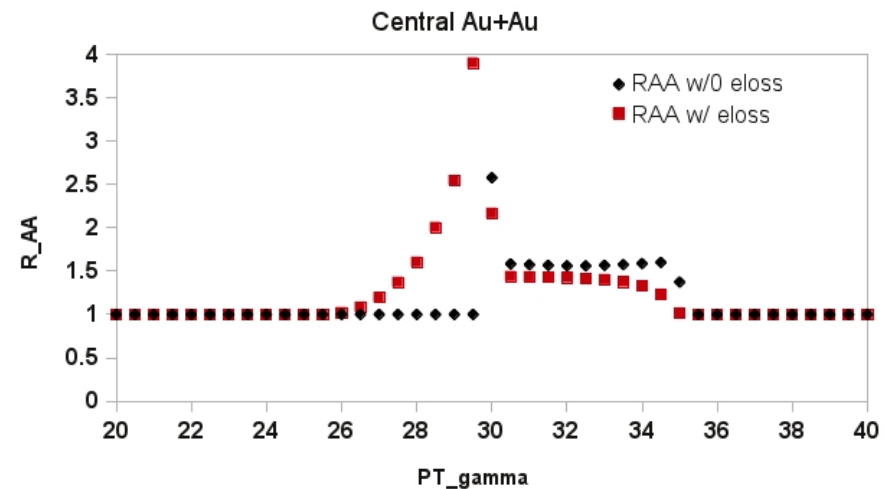
Jet-Triggered Photons

- Test with 30-35 GeV jet.
- Look for photons on away-side $\pm 15^\circ$.
- LO kinematics; energy loss for quarks/gluon before conversion

Photon Spectrum for 30-35 GeV Jet Trigger



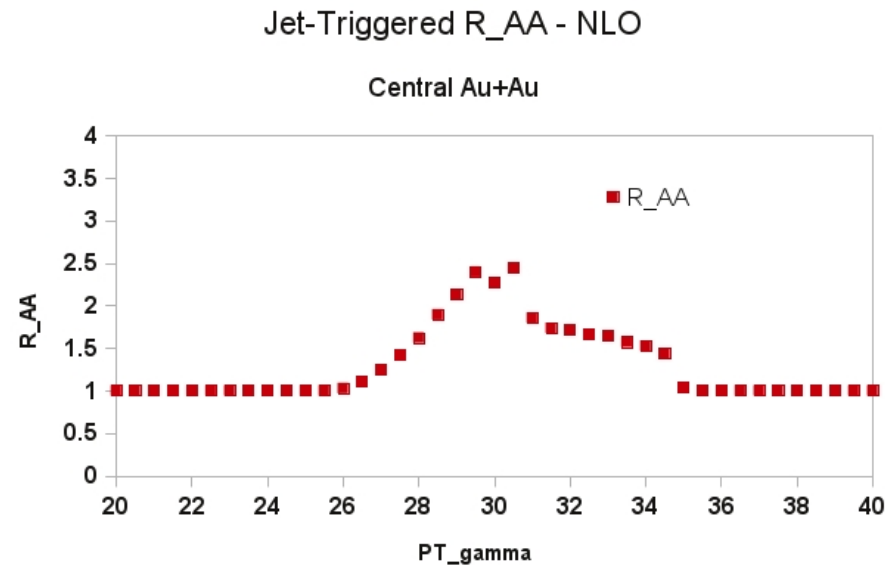
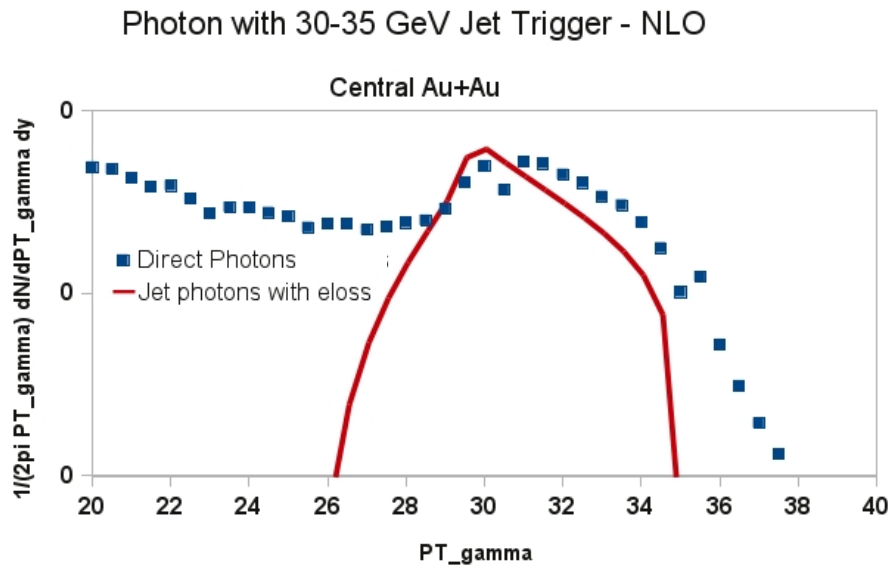
Jet-Triggered R_{AA}



- Possible signal despite finite trigger window

Jet-Triggered Photons

- Same in NLO:



- Further washing out of the signal, but signal survives.

Conclusions

- Signal seems to be there but can it be measured?
- Go as low as possible with jet energy and high enough with γ/π separation.
- Look for rapid changes in jet-triggered photon R_{AA} below the trigger window.
- No “energy loss” for trigger jet. Large R ?



Backup



Inclusive Photon

- Same energy loss and fireball model as for triggered spectra.

