

## Direct Photons

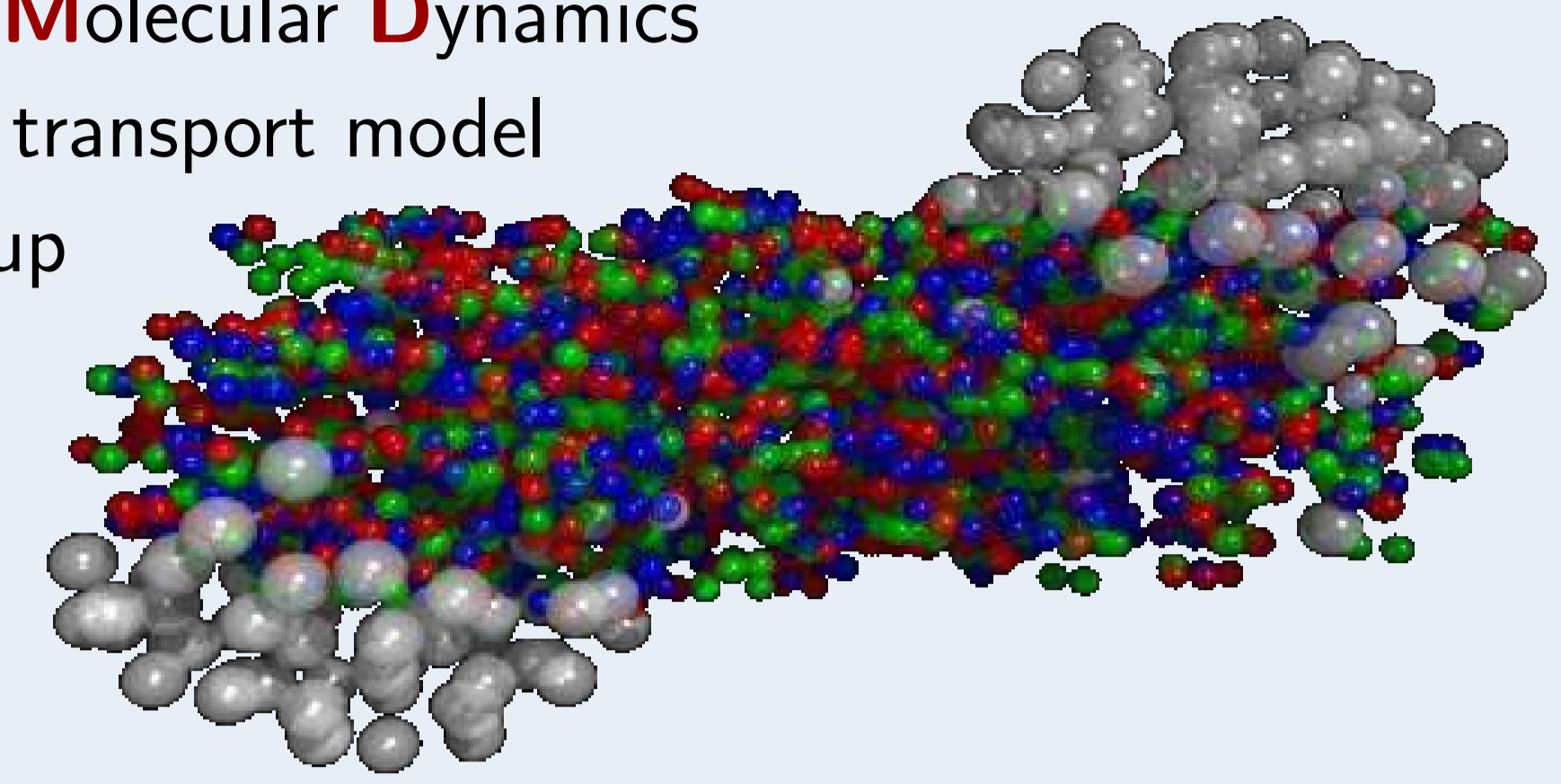
- Small production cross-section: Not many photons produced
- Small rescattering cross-section: Photons, once created, reach detector
- ⇒ Give insight to all stages of a heavy-ion collision
- Most photons come from hadronic decays, e.g.  $\pi^0 \rightarrow \gamma\gamma$
- Direct photons are emitted from fireball
- Measurements available from WA 98 and PHENIX

### Photons from the model

- Photon emission is calculated perturbatively
  - UrQMD: calculate distribution of photons created in each collision
  - Hydro: calculate distribution in each fluid cell for every timestep
  - Different channels implemented in both models:
- Common channels:  $\pi\pi \rightarrow \gamma\rho$ ,  $\pi\rho \rightarrow \gamma\pi$
- Only in UrQMD:  $\pi\eta \rightarrow \gamma\pi$ ,  $\pi\pi \rightarrow \gamma\eta$ ,  $\pi\pi \rightarrow \gamma\gamma$
- Only in Hydro:  $\pi K^* \rightarrow \gamma K$ ,  $\pi K \rightarrow \gamma K^*$ ,  $\rho K \rightarrow \gamma K$ ,  $KK^* \rightarrow \gamma\pi$

## UrQMD

- Ultra-Relativistic Quantum Molecular Dynamics
- Purely hadronic microscopic transport model
- All hadrons and resonances up to  $m = 2.2$  GeV included
- No in-medium effects
- Full collision and hadron history known



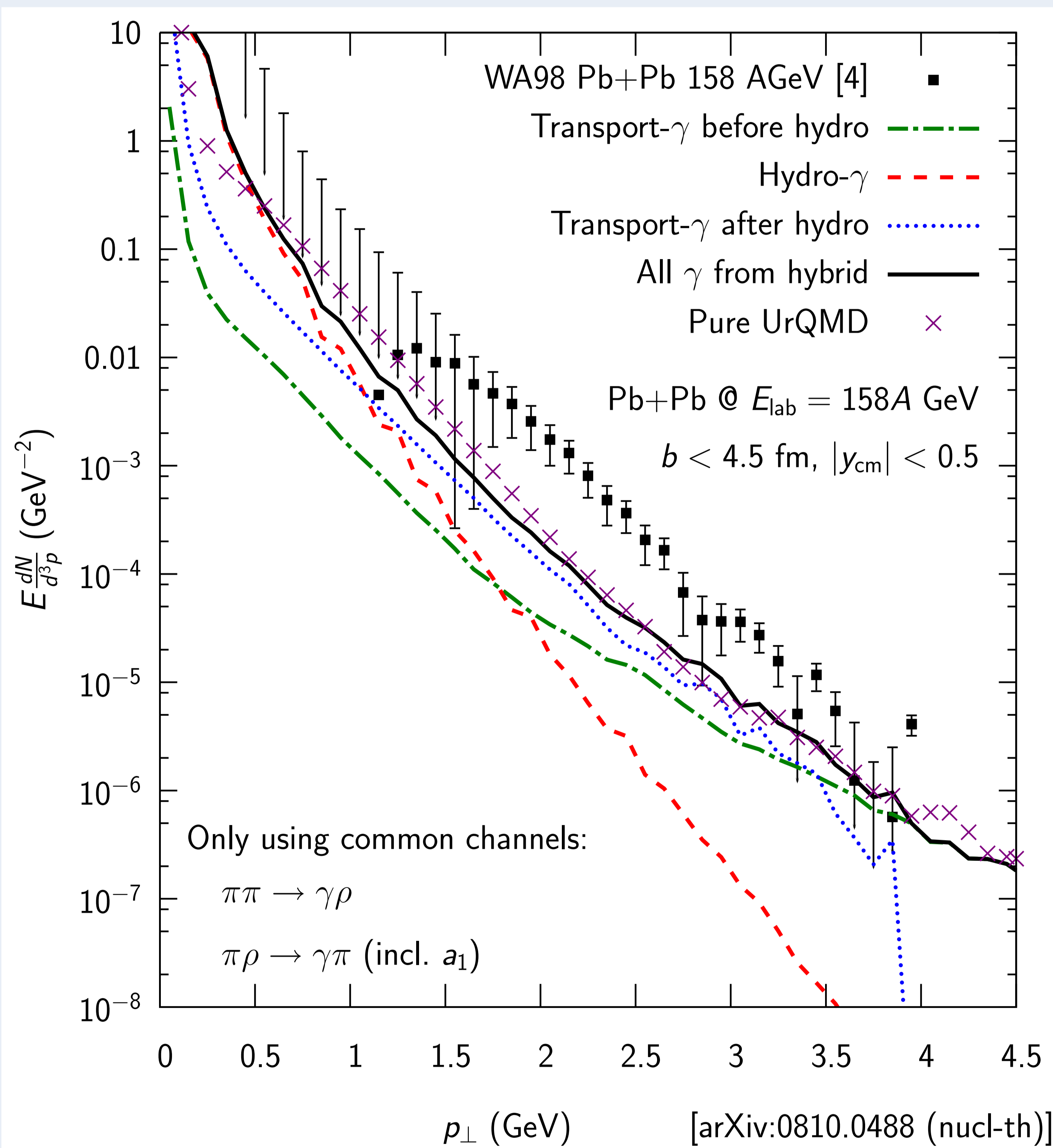
Recent extension:

### Hybrid model [3]

- Transport coupled to hydrodynamics
  - UrQMD until nuclei overlap
  - Hydro for the high-density part
  - UrQMD for low-density rescatterings
- See also talk by Hannah Petersen: Session 2B (Tuesday, 17:30)
- Here: only hadronic equation of state is used

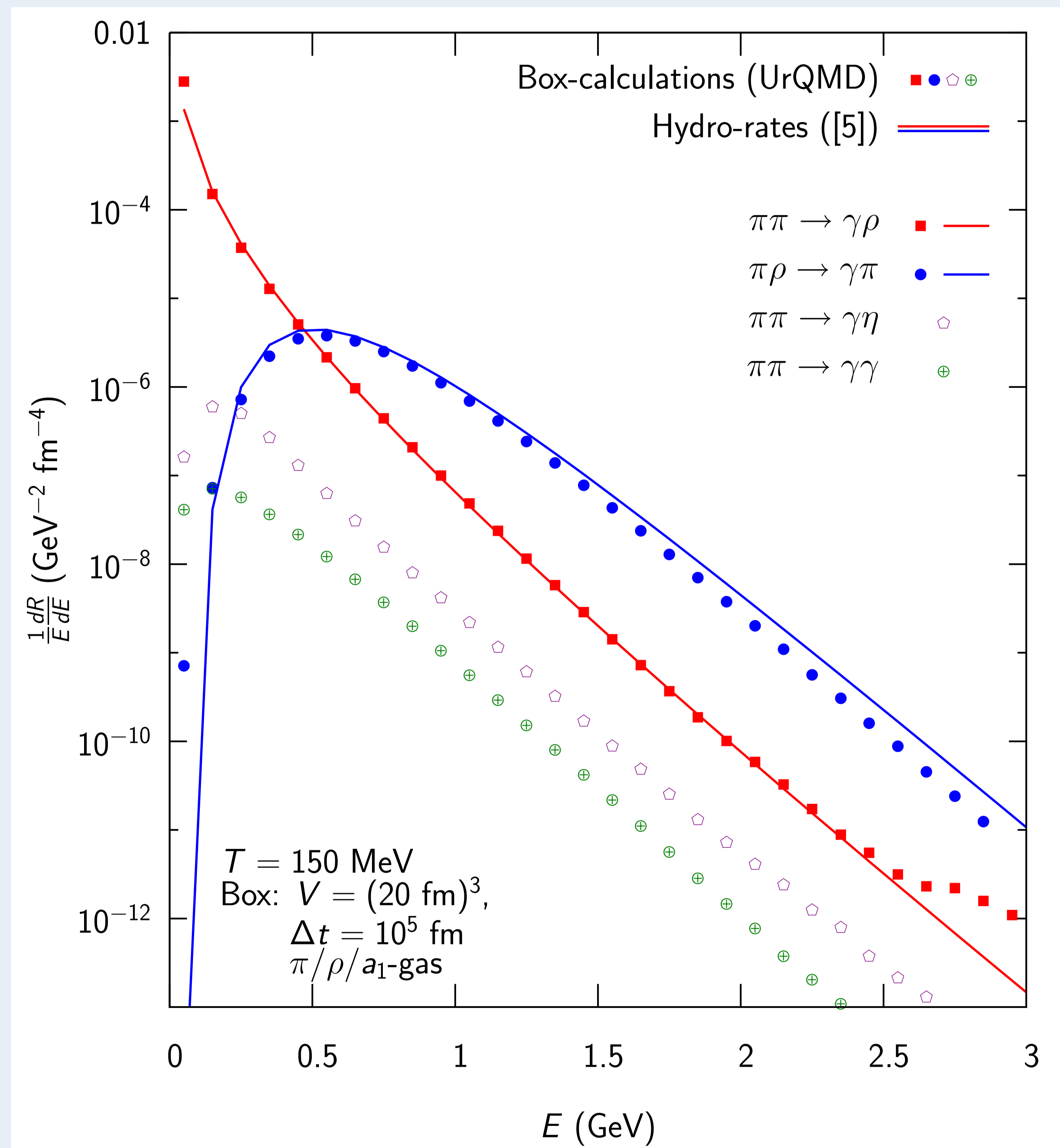
## Results

### Spectra



- Good agreement between hybrid and transport model
- Small deviations at low  $p_{\perp}$
- Both models underpredict the data

### Rates



- Rates from box-calculation with UrQMD agree with rates from [5].
- $\pi\pi \rightarrow \gamma\gamma$  and  $\pi\pi \rightarrow \gamma\eta$  do not contribute significantly

## Summary

- Hybrid- and transport model agree well at top SPS-energies
- Both models undershoot data
- Rates from transport agree well with hydro rates from [5]

## Outlook

- Number of implemented channels will be extended
- Comparison of different EoS in hydro-phase — what does QGP change?
- Add photons from hard pQCD-scatterings and hadronic decays

## References

- B. Bäuchle, M. Bleicher, arXiv:0810.0488 [nucl-th] (EPJ C in print)
- B. Bäuchle, M. Bleicher, in preparation
- H. Petersen *et al.*, Phys. Rev. C **78** 044901 (2008)
- WA 98, Phys. Rev. Lett. **85**, 3595 (2000), nucl-ex/0006007
- S. Turbide *et al.* Phys. Rev. C **69**, 014903 (2004)

See also:

Talk by **Hannah Petersen**: Session 2B (Tuesday, 17:30)

Poster by **Jan Steinheimer-Froschauer**: Observables for the deconfinement p.t. in a hybrid model

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FIAS Frankfurt Institute for Advanced Studies