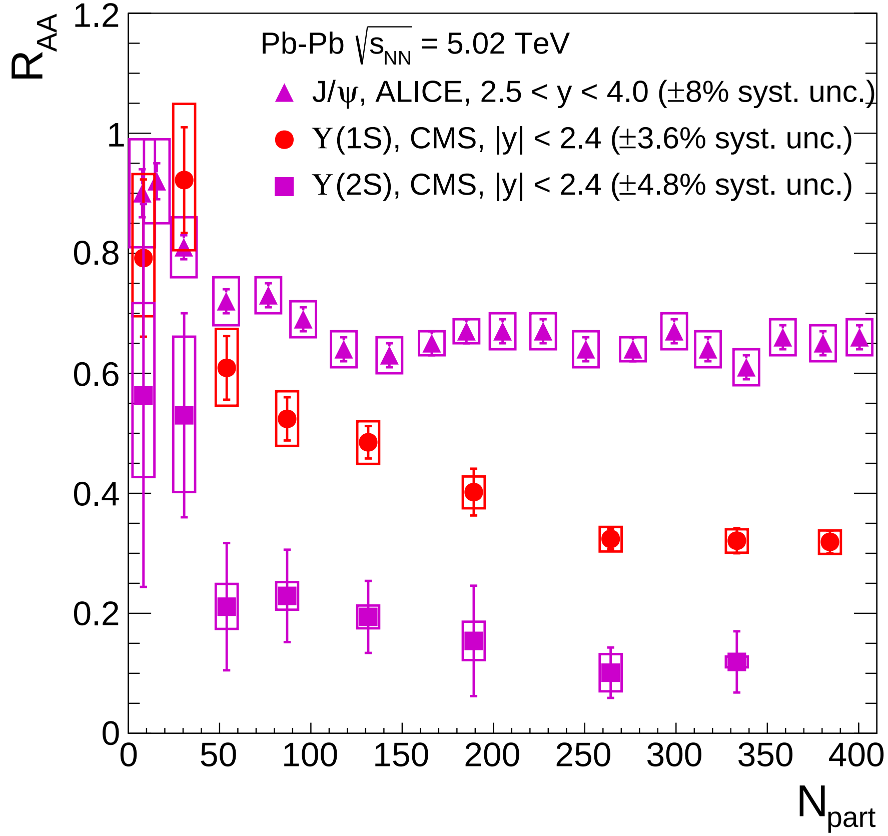
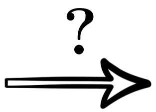
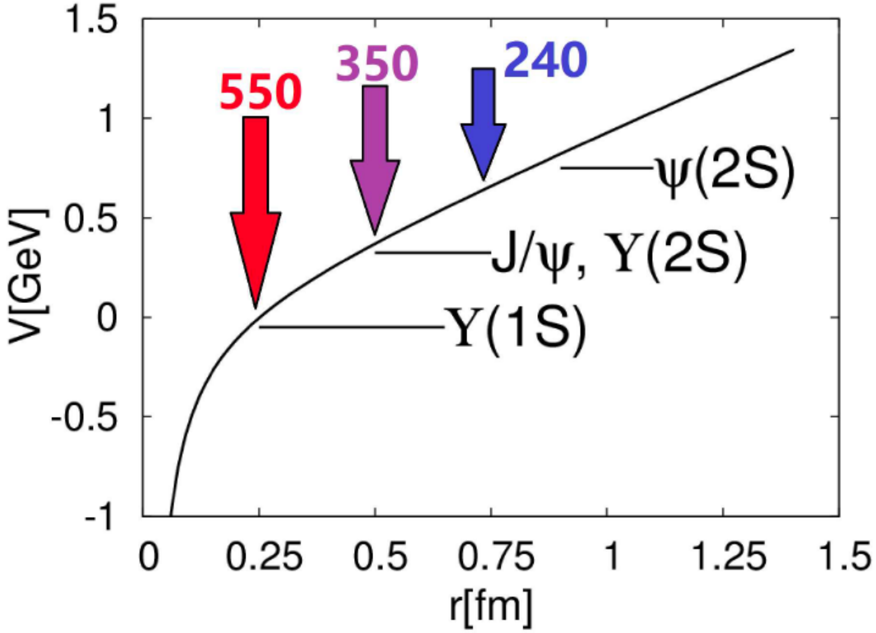
EMMI Rapid Reaction Task Force

Suppression and (re)generation of quarkonium in heavy-ion collisions at the LHC

16-20.12.2019, GSI Darmstadt







Reimbursements

mail to *Sekretariat EMMI-Office: emmi-office@gsi.de* with bank account and private address; copy of the travel documents

Hotel/guesthouse is payed

Homework

...restricted set, to make it more realistic to achieve it

Pb–Pb, $\sqrt{s_{NN}}$=5.02 TeV

- R_{AA} calculations vs. N_{part}, p_T ...*no feed down*
- Reaction rates vs. temperature
- $T(\tau)$ ...central cell
- A brief description of your main relevant inputs, e.g., cold-nuclear-matter effects (shadowing, nuclear absorption, Cronin), ccbar cross section $\mathrm{d}N_{c\bar{c}}/\mathrm{d}y$ (vs. pT), hot matter suppression/regeneration mechanisms (QGP and/or hadronic matter), dissociation temperature (if applicable), in-medium potential, input (reference) pT spectrum of quarkonia, etc.

Topical days - charges

Day-2: *Inelastic Quarkonium Reaction Rates*

Identify and qualitatively understand differences in charmonium and bottomonium reaction rates as used in transport models, scrutinize differences in calculating them, quantify their dependence on external parameters (momentum, temperature, binding energy, medium constituents) and develop criteria toward a more uniform framework for calculating them.

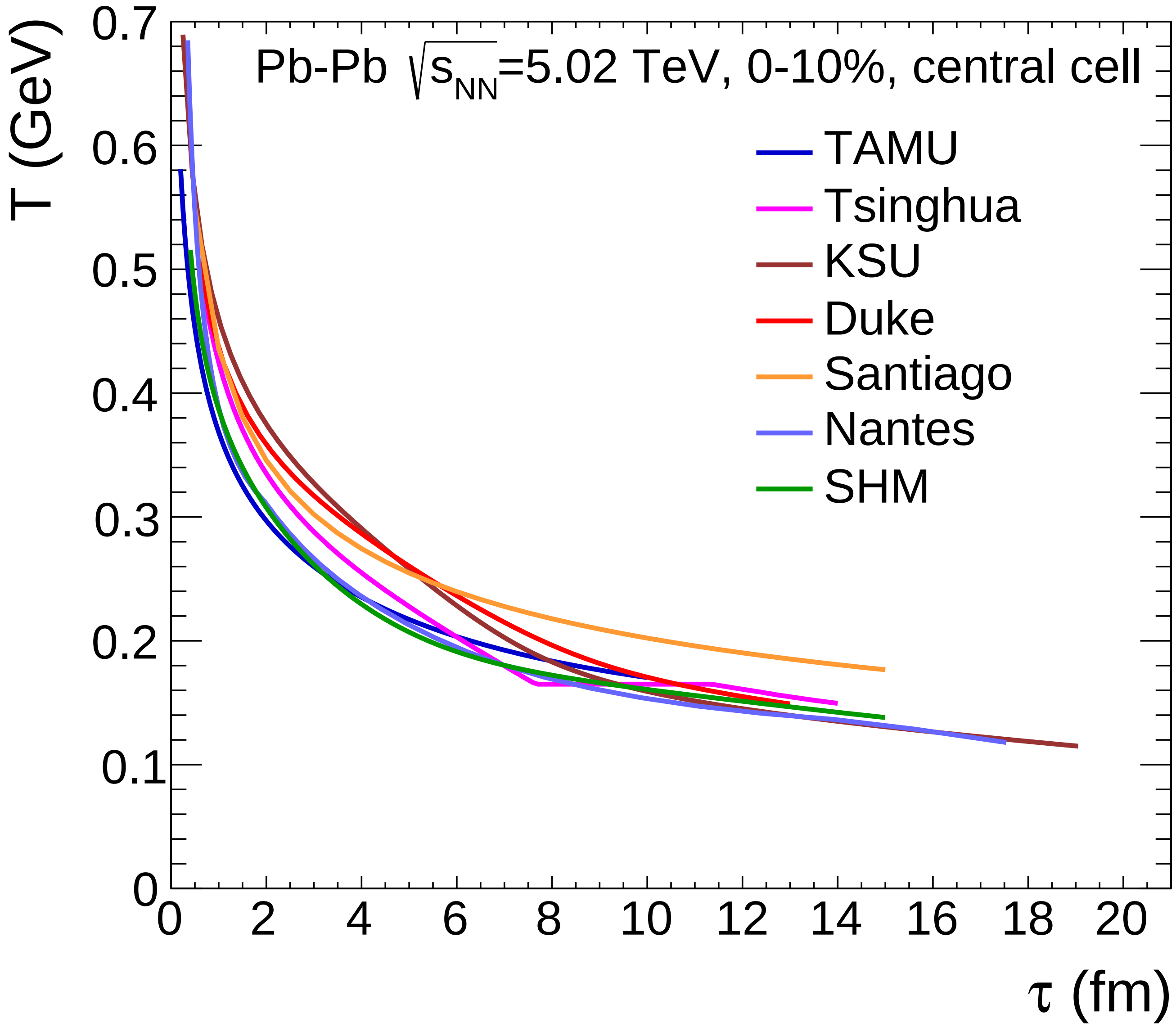
Day-3: *Quarkonium equilibrium limits and properties in hot matter*

Assess the equilibrium limit of quarkonium abundances in QGP and hadronic matter, as a key transport parameter, with critical ingredients such as the in-medium potential, Debye mass and heavy-quark masses, and how the knowledge from lattice QCD on those can be implemented in the models (using, e.g., EFT, T-matrix, potential models etc.).

Day-4: *Off-equilibrium effects in transport evolution*

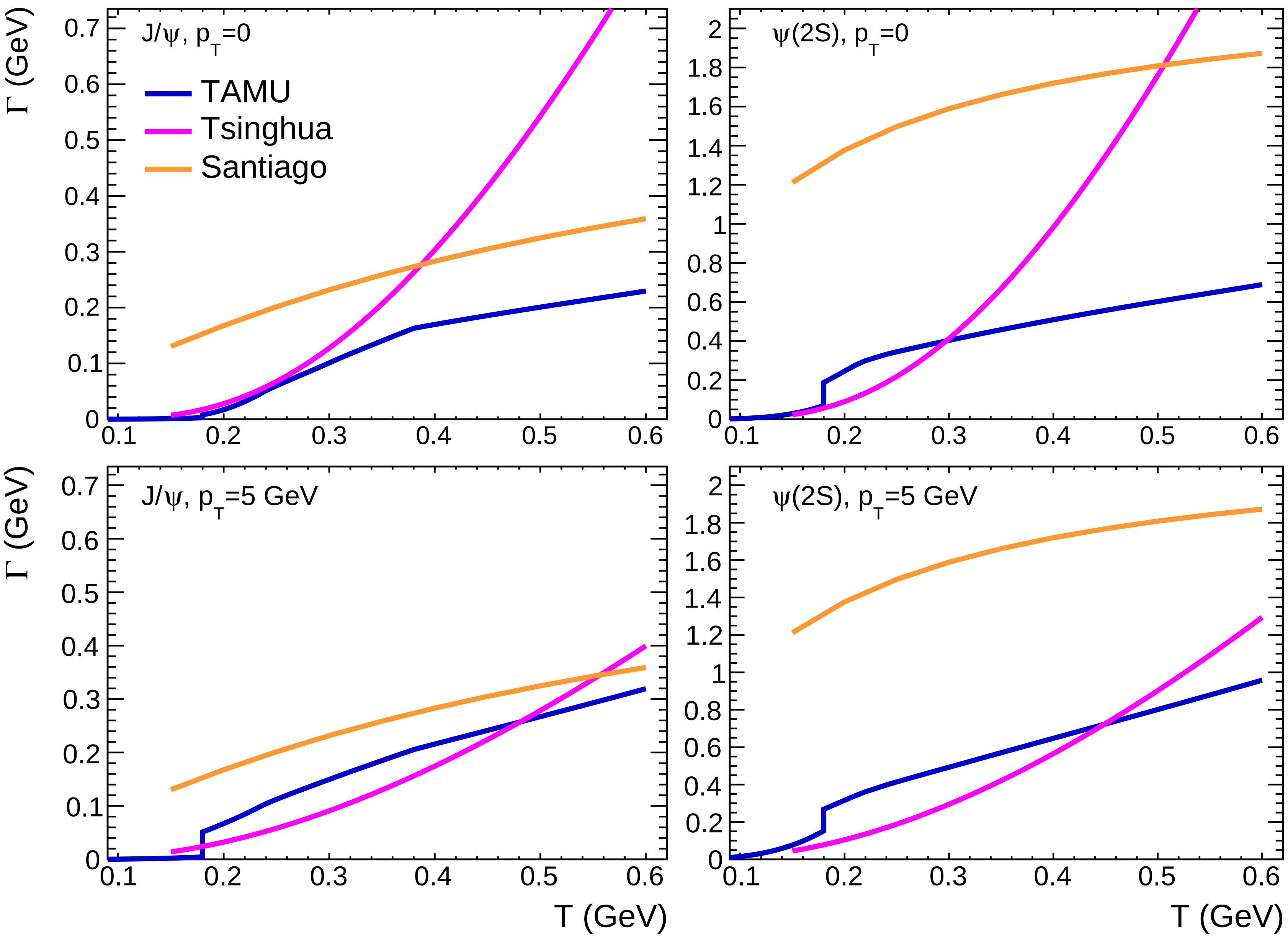
Identify off-equilibrium effects that are not encoded in the (equilibrium) transport parameters discussed during day-2 and -3 (e.g., incomplete thermalization of single heavy-quark distributions, anisotropies of the bulk medium, quantum coherence and its dissipation including initial formation time effects, equilibration of singlet vs octet channels, adiabatic limit etc.), how they are implemented and quantitatively affect the predictions for quarkonium observables in AA collisions.

Temperature

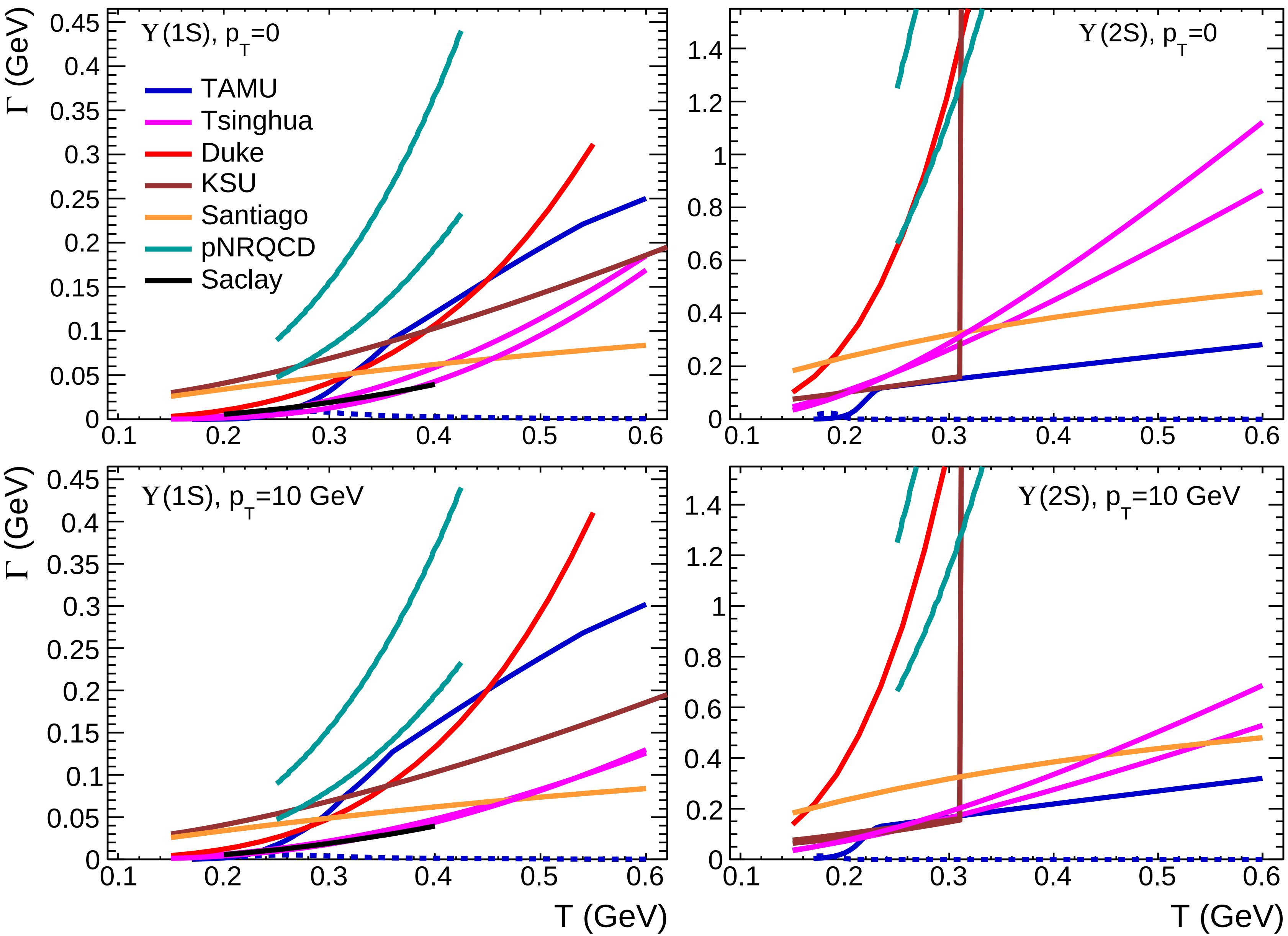


Santiago: 1-D Bjorken; SHM: IP-Glasma-MUSIC

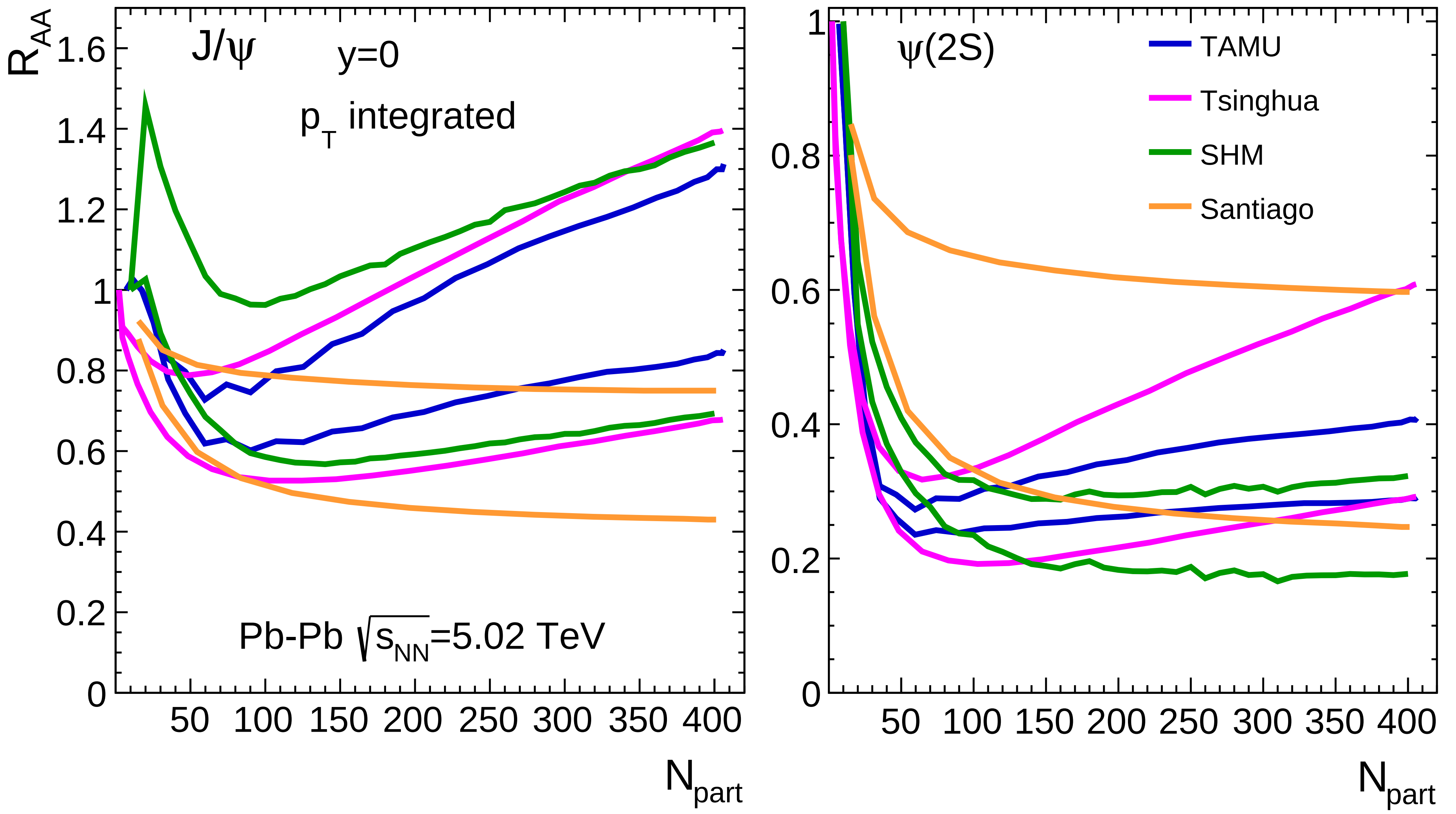
Reaction rates, ψ



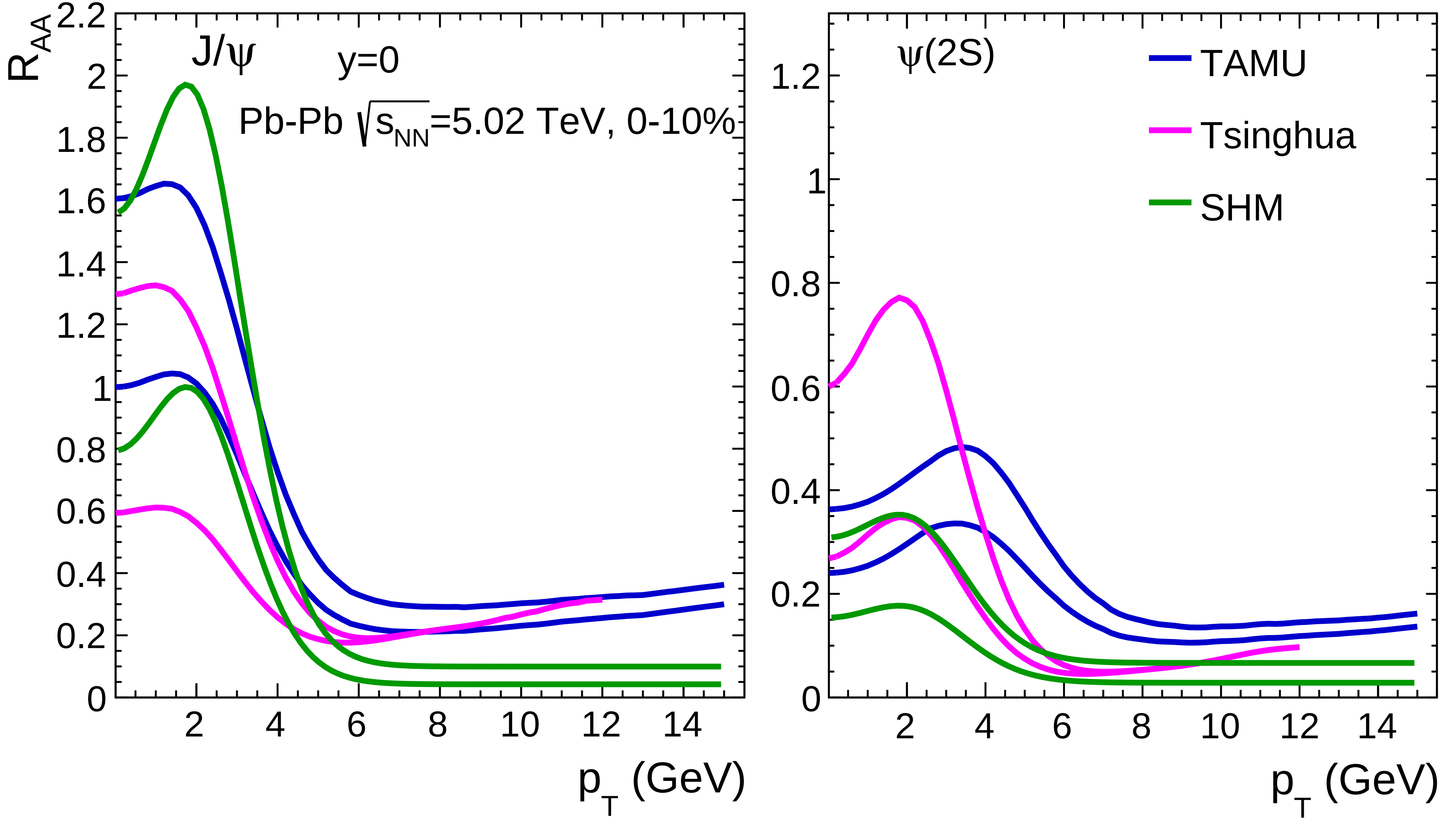
Reaction rates, Υ



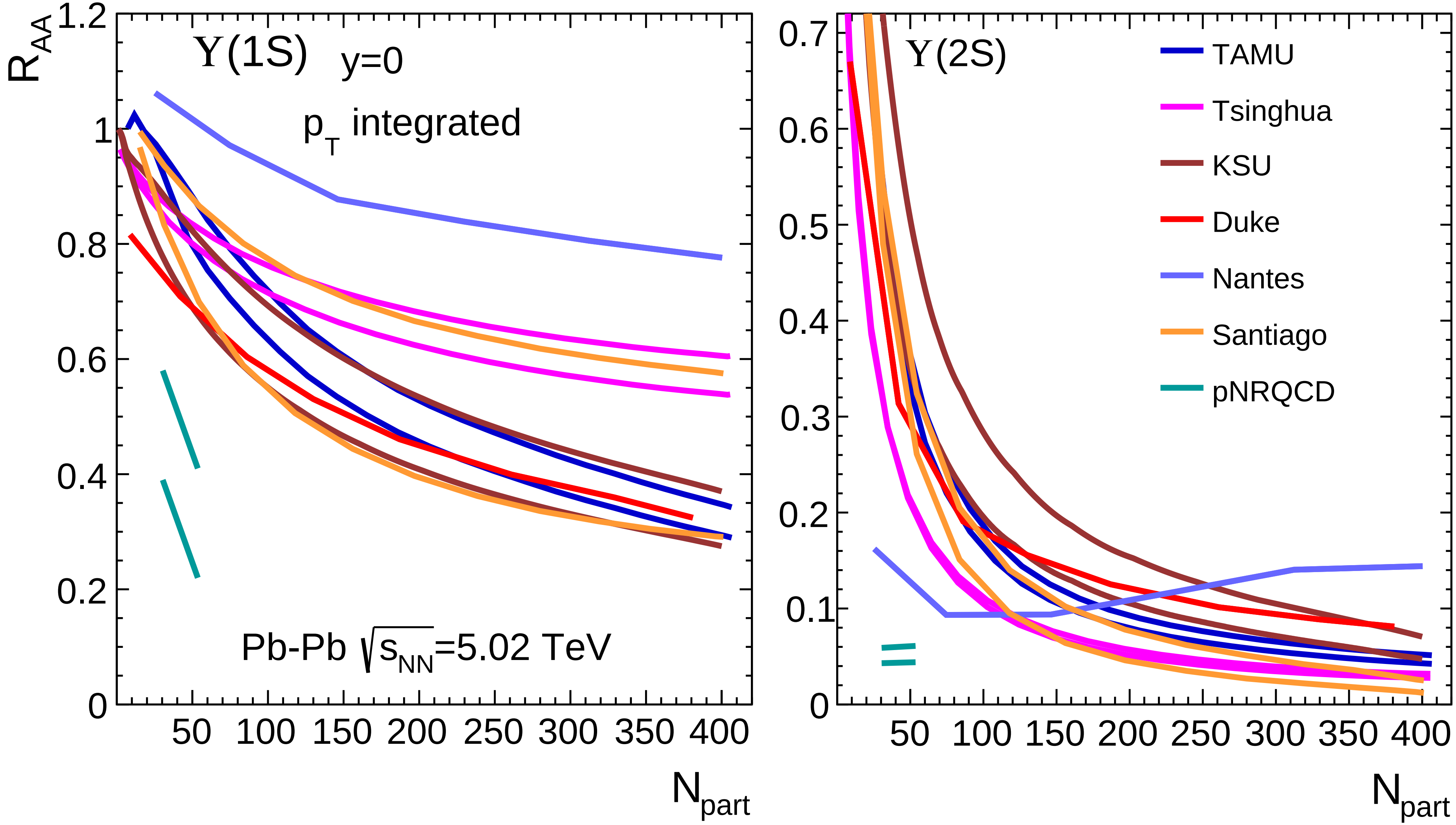
R_{AA}, ψ


R_{AA}
J/ψ
y=0
p_T integrated
Pb-Pb $\sqrt{s_{NN}}$=5.02 TeV
N_{part}
ψ(2S)
TAMU
Tsinghua
SHM
Santiago
N_{part}

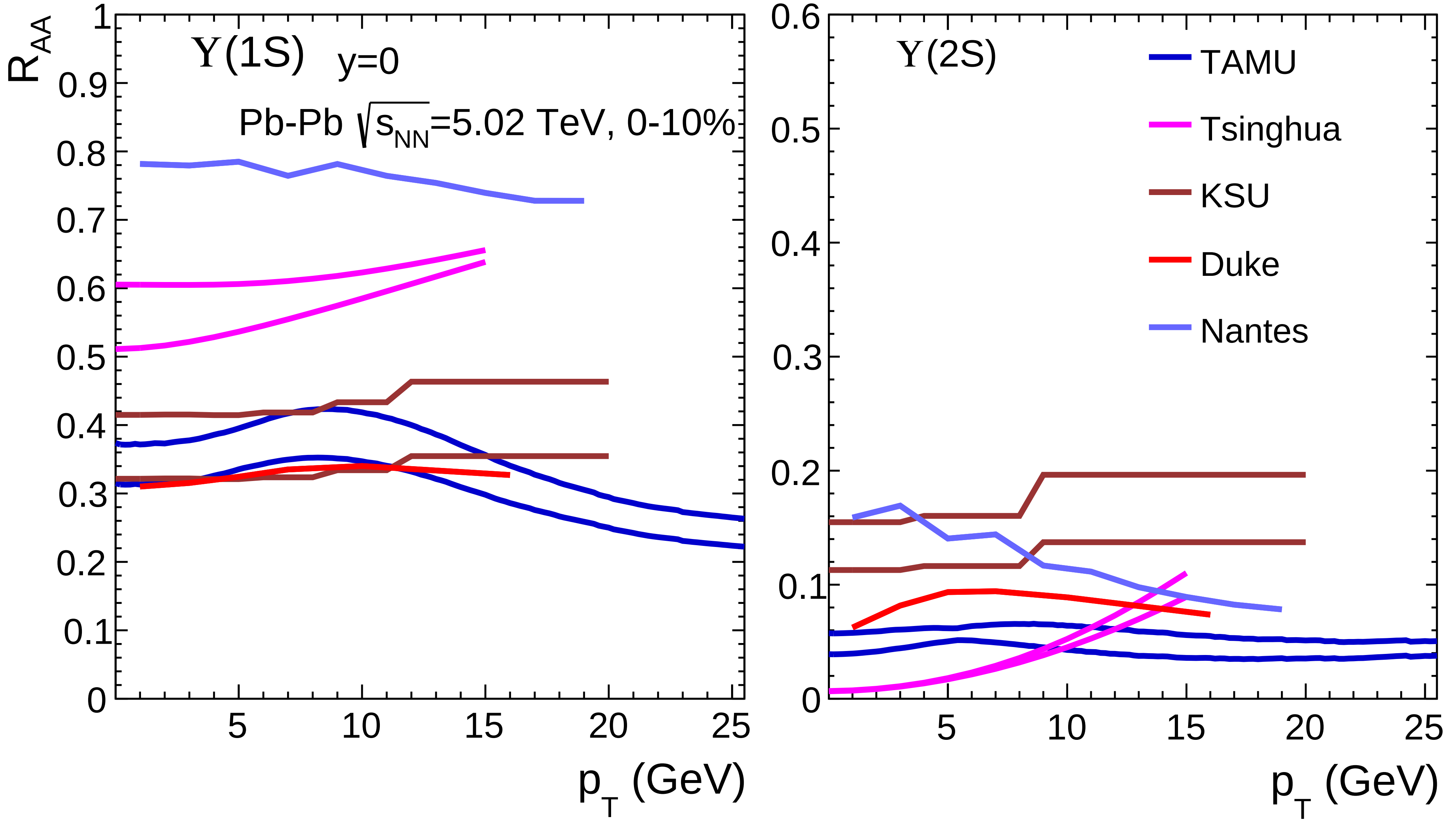
R_{AA}, ψ


R_AA
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
J/ψ
y=0
Pb-Pb √s_NN=5.02 TeV, 0-10%
2
4
6
8
10
12
14
p_T (GeV)
ψ(2S)
TAMU
Tsinghua
SHM
1.2
1
0.8
0.6
0.4
0.2
0
2
4
6
8
10
12
14
p_T (GeV)

R_{AA}, Υ


R_{AA}
Υ(1S) y=0
p_T integrated
Pb-Pb $\sqrt{s_{NN}}$=5.02 TeV
N_{part}
Υ(2S)
TAMU
Tsinghua
KSU
Duke
Nantes
Santiago
pNRQCD
N_{part}

R_{AA}, Υ


R_AA
Υ(1S) y=0
Pb-Pb √s_NN=5.02 TeV, 0-10%
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
5
10
15
20
25
p_T (GeV)
Υ(2S)
TAMU
Tsinghua
KSU
Duke
Nantes
0.6
0.5
0.4
0.3
0.2
0.1
0
5
10
15
20
25
p_T (GeV)