

Comments on p-Pb

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From Smbat (Tuesday)

Some topics for the forthcoming discussion on CNM

- problem of the normalization to p-p data, since the c.m.s. energies for p-A and p-p probably will be different at LHC (8.8 and 14 (7) TeV).
 - interpolation of p-p data to p-A energy? (large discussion expected in Thursday)
 - how disentangle quarkonium nuclear absorption (though expected to be small) from shadowing? for example:
 - normalization to open HF production in p-A – same shadowing, no absorption
 - shadowing measurement from quarkonia production in UPC – no absorption
 - absence of a full p-A (or B-A) event generator including the underlying event and production of the HF hadrons and quarkonia states with a «correct» (corresponding to NLO QCD predictions) kinematics and cross sections. Even the last version of HIJING2.0 largely underestimates the HF and quarkonia production.
- In ALICE we use the method of cocktail generators instead, but for centrality studies it becomes too complex, many parameterizations of the quarkonia p_T and y -distributions needed for different centrality bins and different shadowing models.
- ...

Some math

- With same magnet settings, p-Pb will have different \sqrt{s} (same story as pp)
 - $\sqrt{s}_{12} = \sqrt{(Z_1 Z_2 / A_1 A_2)} \times \sqrt{s}_{pp} \rightarrow 4.4 \text{ TeV (for 7 TeV)}$
 - However, we can decide to reduce it to the AA values
 - In any case, p-Pb will be asymmetric !
 - $\Delta y = 0.5 \ln (Z_1 A_2 / Z_2 A_1) = 0.47$ for p-Pb (very worrisome for acceptance edges...)
 - These two effects make you probe the same x , on one side (assuming $2 \rightarrow 1$ process)
 - $x = m_T / \sqrt{s} \times \exp(y)$
 - Remark: Alice will probably need p-Pb and Pb-p
 - Alice + CMS&ATLAS + LHCb will probe a large (y, p_T)
- Better to be at the same \sqrt{s} and to build up references from the large (y, p_T) mapped by the 4 experiments

p-Pb vs d-Pb or α -Pb ?

- p-Pb pro: much better targeting (d wave function is wide)
- d-Pb pro: closer to Pb-Pb lower Δy (half)
- What do we prefer?

How many effects?

- Now, the larger kinematics, the more confused you are
 - NAXX ($\Delta y \approx 1$) introduced σ_{abs}
 - RHIC ($\Delta y \approx 4.5$) introduced shadowing
 - (and recent data at the edge requires something else)
 - Large acceptance pA results (HERAB, Tevatron) were never really understood...
- If our pA data are not nice and smooth, then we will have too many ways of extrapolating
 - RHIC current situation, pessimistic view

A last hope

- If AA effects are far off from pA effects, at the qualitative level, then we'll make a physics case anyway
 - Optimistic view
 - Like jet quenching at RHIC →
- We may even don't need pA and pp to make some physics case
 - J/ ψ regeneration
- The exact strategy will depend on first hints

