37th INTERNATIONAL CONFERENCE ON HIGH ENERGY PHYSICS
2-9-JULY-2014-VALENCIA

Contribution ID : **793** Type : **Oral presentation**

Nuclear Matter effects on Quarkonia and Heavy-Quarks

Friday, 4 July 2014 12:10 (20)

The last pPb run at 5 TeV which took place at CERN LHC provides measurements of the Nuclear Matter (NM) effects at an unprecedented energy, especially for the heavy quark and quarkonium sectors. The comparison of the experimental results to the phenomenological inputs is therefore essential, both to put stringent constrains of their main features and to envision the next most discriminating measurements.

We study the NM effects on J/psi [1], Upsilon [2] and open beauty [3] production. We consider an exact 2 to 2 kinematics (as expected from LO pQCD) for the bulk of the heavy-quark and quarkonium [4] production process. We show that the evaluation of the J/psi nuclear modification factor R_pPb suffers from large factorisation scale uncertainties, on top of the already large uncertainties due to the current knowledge of the nuclear modifications (shadowing, EMC effects, ...) of the parton distribution. Such scale uncertainties are reduced for the Upsilon case, owing to the larger mass and hence the larger scale of the production process. Also, we advocate that the nuclear absorption of the pre-resonant b-bbar pair should be negligible at LHC energies.

We finally emphasize the complementarity between the studies of open heavy flavour and quarkonium production in pA collisions. Indeed, there is no debate that the heavy quark propagates as a colored object in the nuclear matter. On the contrary, for the quarkonia, there is neither a consensus on the impact of the possible break-up of the heavy quark pair in the matter nor on whether the pair propagates in a color singlet or octet state and is thus subject to a fractional energy loss, recently revived in the literature [5].

References

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Session Classification : Heavy Ions

Track Classification : Heavy Ion Physics