# Why the formula $\left\langle dN_{\rm ch}^{AA}/d\eta\right\rangle = \langle dN_{\rm ch}^{pp}/d\eta\rangle \left[xN_{\rm part}/2+(1-x)N_{\rm coll}\right]$ should be deprecated

Abstract for Quark Matter 2012 poster

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The fact that the multiplicity density in A+A collisions increases faster than the number of participants has led to the popular formula $\left\langle dN_{\rm ch}^{AA}/d\eta\right\rangle = \langle dN_{\rm ch}^{pp}/d\eta\rangle \left[xN_{\rm part}/2+(1-x)N_{\rm coll}\right]$ with the implication that point-like hard-scattering contributes to the total charge multiplicity or $\sum E_T$ distributions. For $\sqrt{s}=630$ GeV $\bar{p}-p$ collisions, the UA2 collaboration [1] measured that the hard-scattering component of $\sum E_T$ distributions only becomes apparent at the level of $\sim 1/500$ the total cross-section, clearly indicating that the contribution of hard-process to the multiplicity and $\sum E_T$ distributions is negligible. The universal behavior of $\left\langle dN_{\rm ch}^{AA}/(0.5N_{\rm part}d\eta)\right\rangle$ as a function of $N_{\rm part}$ at RHIC and LHC over the range $7\leq\sqrt{s_{NN}}\leq 2760$ GeV, in spite of the dramatic increase in the ratio of $N_{\rm coll}/N_{\rm part}$ due to the increasing N-N interaction cross section, is another indication. Finally, an $E_T$ distribution which satisfies the popular formula for $\left\langle dN_{\rm ch}^{AA}/d\eta\right\rangle$ will be demonstrated and shown to look nothing like any measured $\sum E_T$ distribution. A more reasonable nuclear geometrical description has been given previously [2, 3, 4] and will be tested with recent data.

## References

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