Charm contribution to hadron yields at LHC

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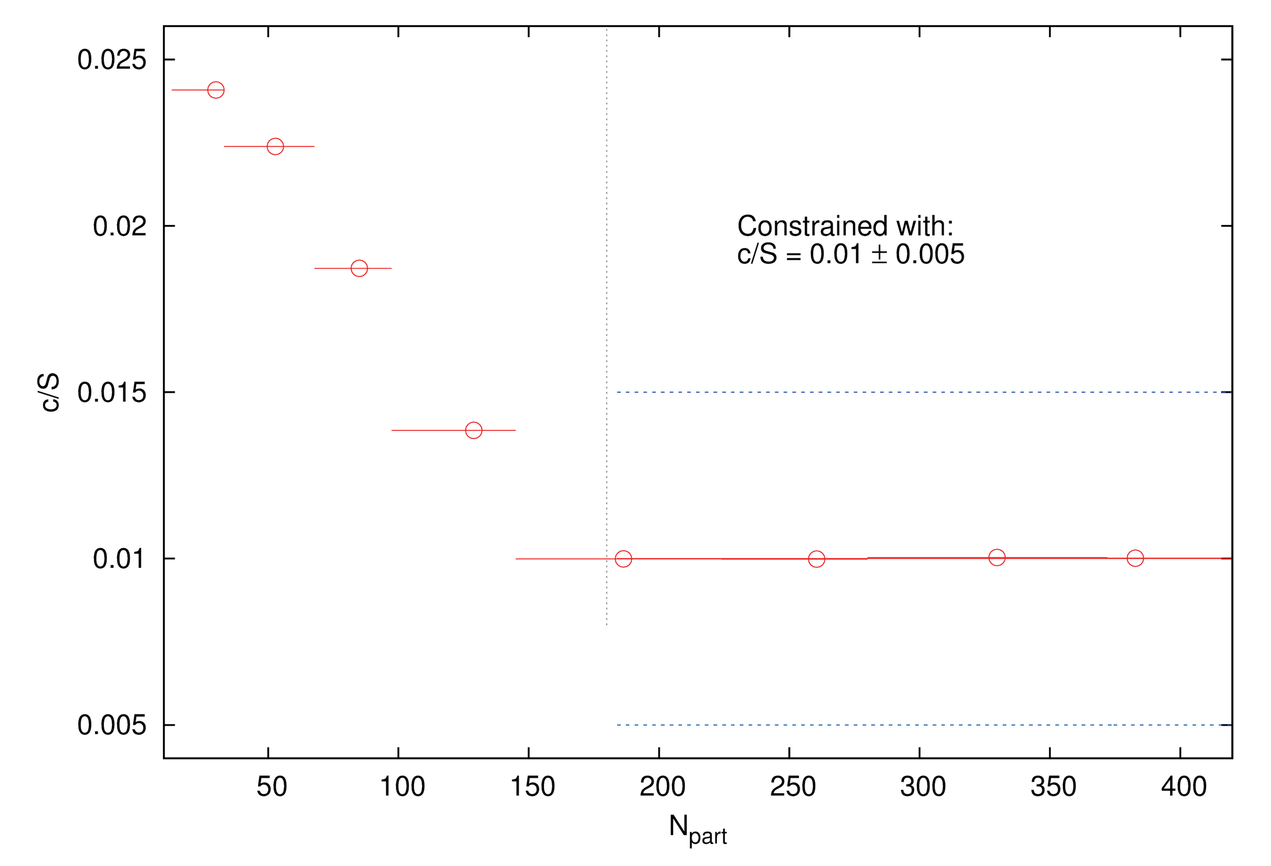
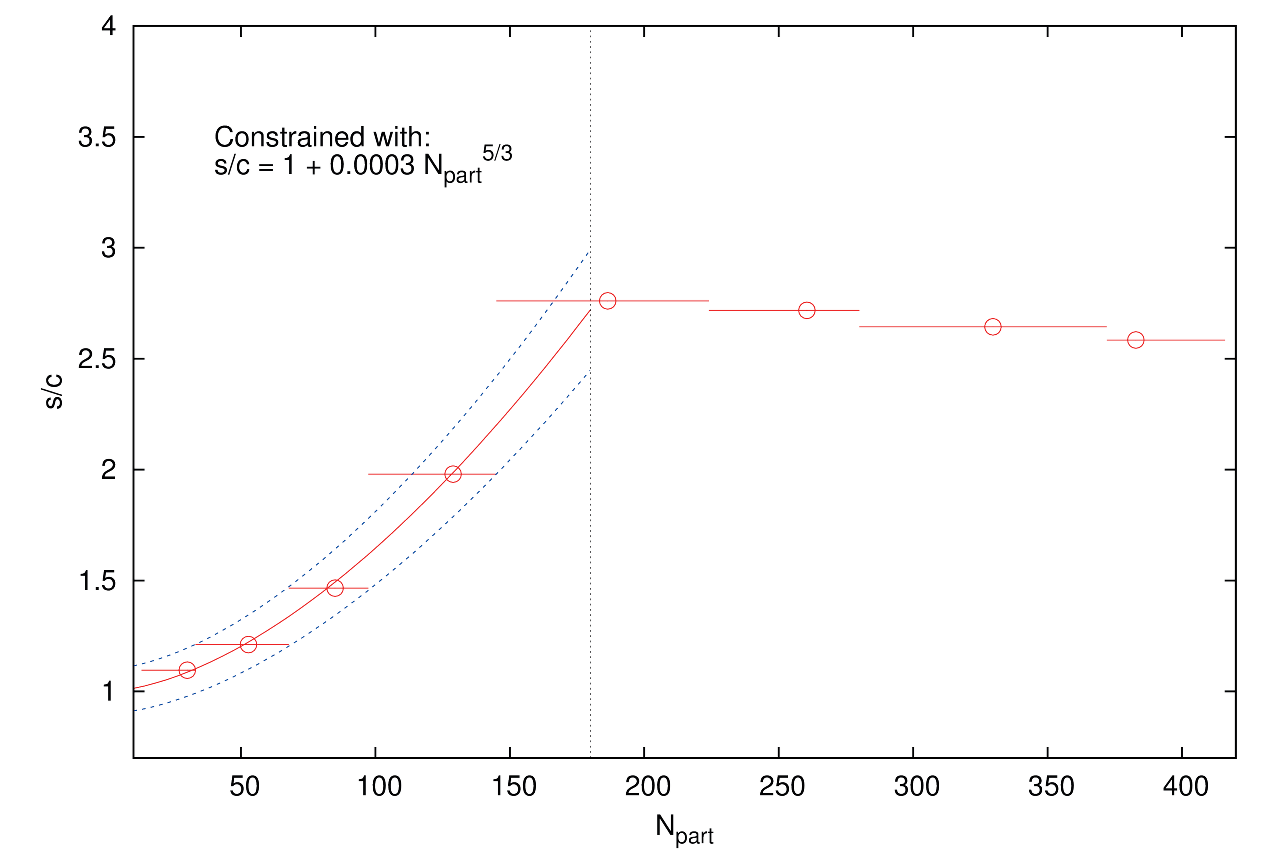
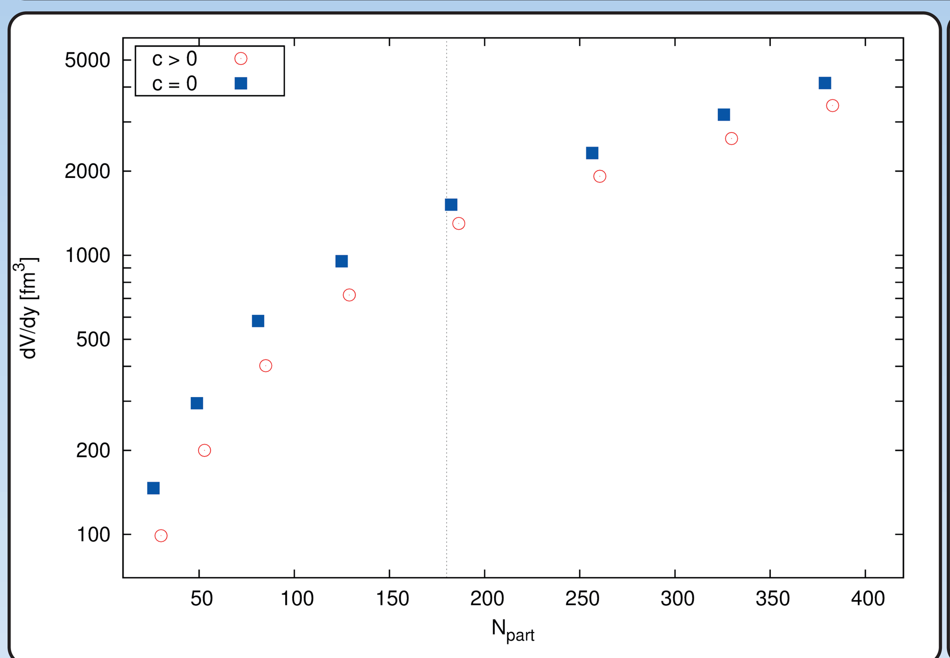
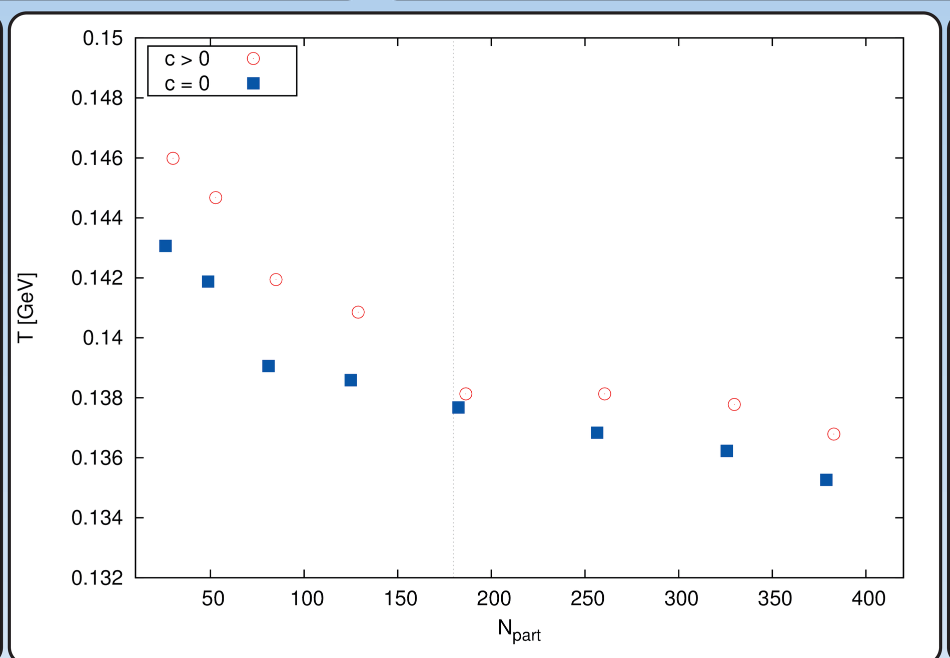
Charm in heavy ion collisions is produced in the hard 'first interaction' processes before partons thermalize into a drop of QGP. Charm survives the QGP evolution and as hadrons emerge in soft hadronization processes, practically every charm or anticharm quark turns into a charmed hadron, small fraction of the charm yield enters multi-charmed hadrons and charmonium states. We assume that in the hadronization process the single charmed hadrons production is governed by the available phase space and their yield is normalized by the total single charm hadron yield. By allowing for charm hadron to charm hadron decay cascades, we establish total fraction of single charm hadrons found in their ground states, which we than decay producing additional soft hadrons. At LHC these cascade products add significant fraction to certain strange hadron yields. We discuss particularly interesting examples such as φ(s̄s), Ξ(ssq) and Ω(sss). The overall peripheral statistical hadronization fit works much better with charm and the outcome predicts the charm particle yield. For central collisions there is little sensitivity since the chemical non-equilibrium fit is very good and we must model the charm yield and contribution. Poster can be downloaded from: http://www.physics.arizona.edu/~petran/files/QM2012-posters/poster1.pdf

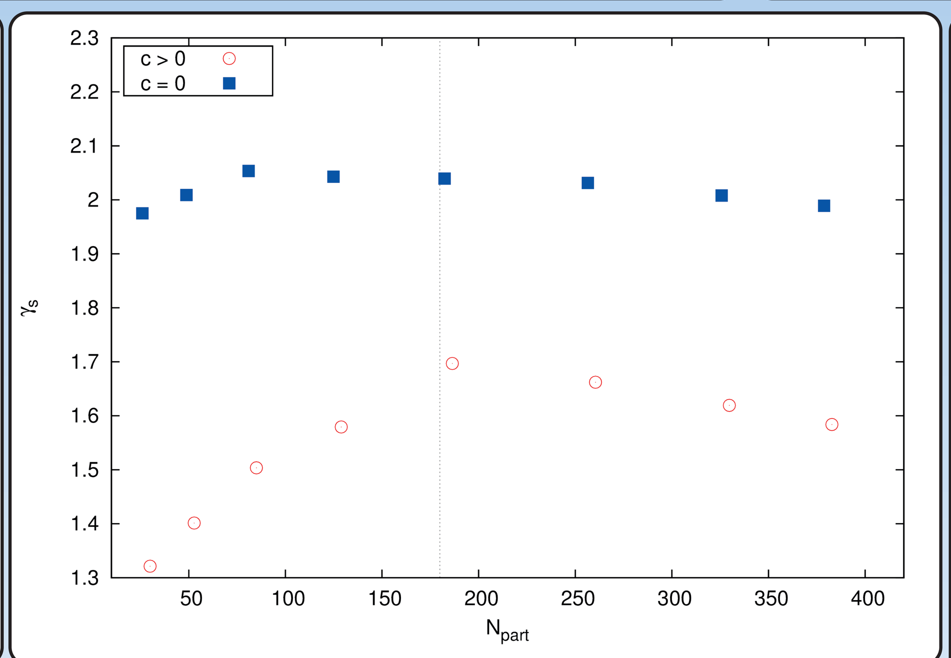


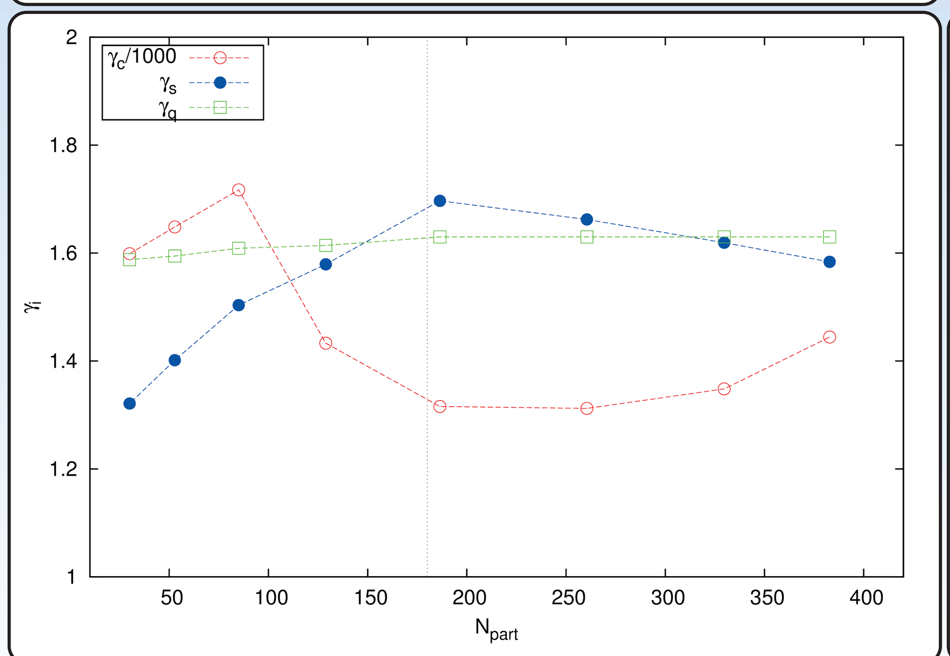


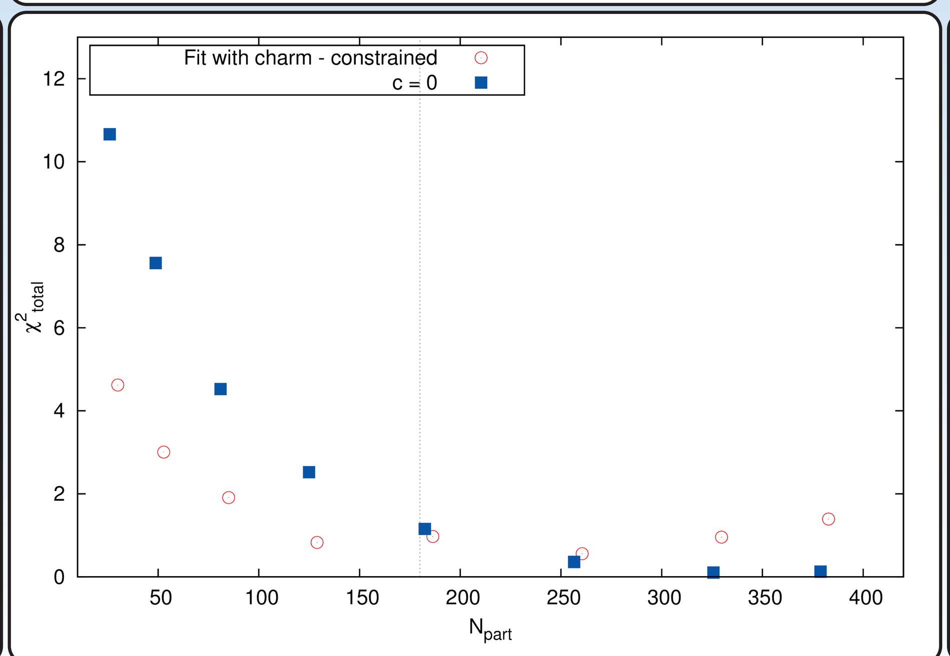
Fits of peripheral collisions converge to symmetric 'c' ='s' quark yield. The ratio s/c=1 must grow due to thermal strangeness production, we call s/c enhancement F. We see in fits that strangeness saturates around s/S = 0.03. For central collisions we expect c/S=s/S×1/(s/c)=0.03/F. We make a model assumption that F=3 which means c/S =0.01. For F=4 we reduce central charm by 30%. We also fix γ_q=1.63, a prefered value when evaluating profiles of results.

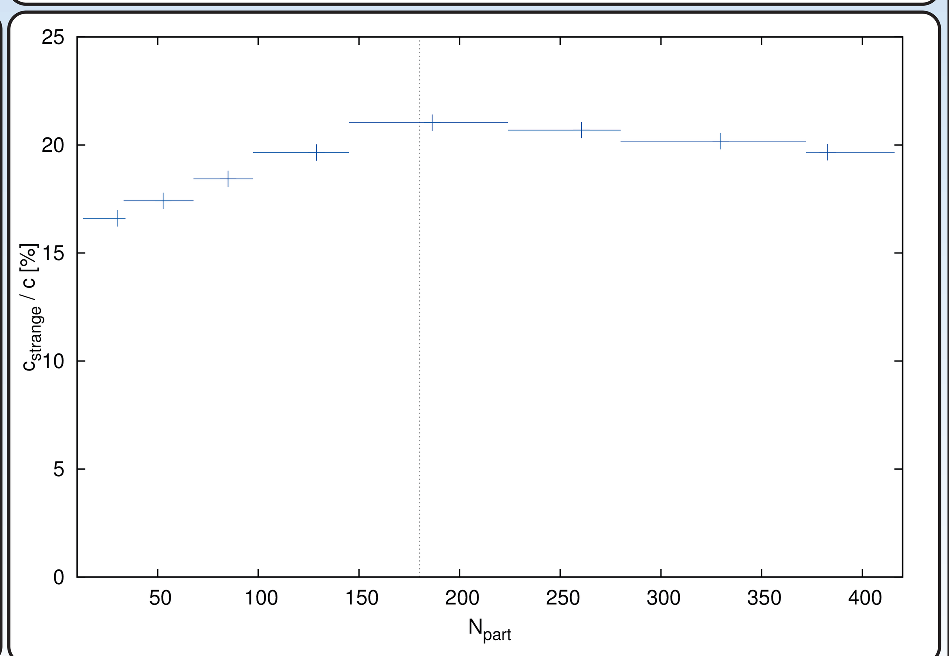


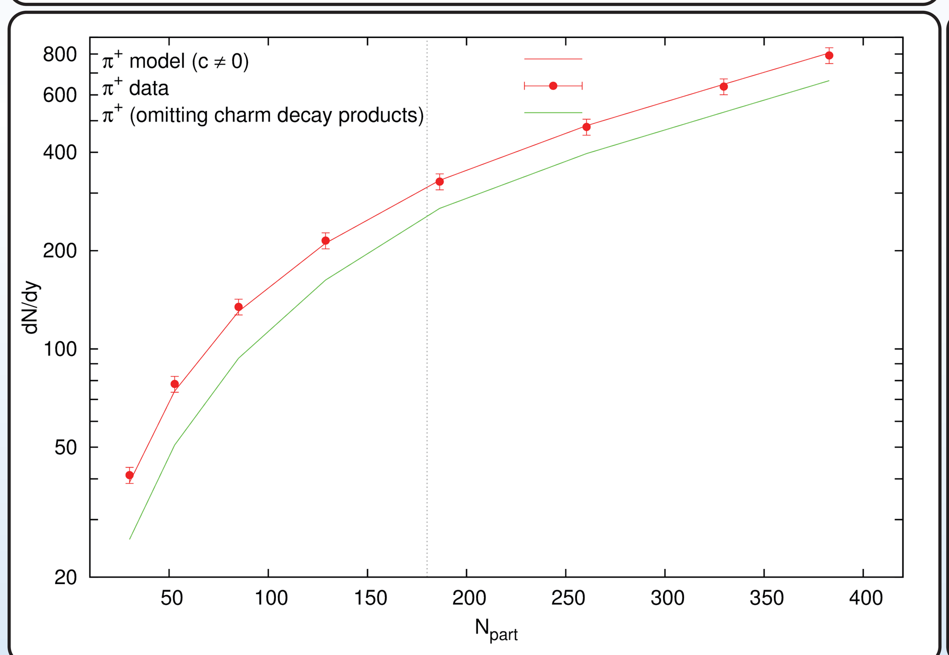


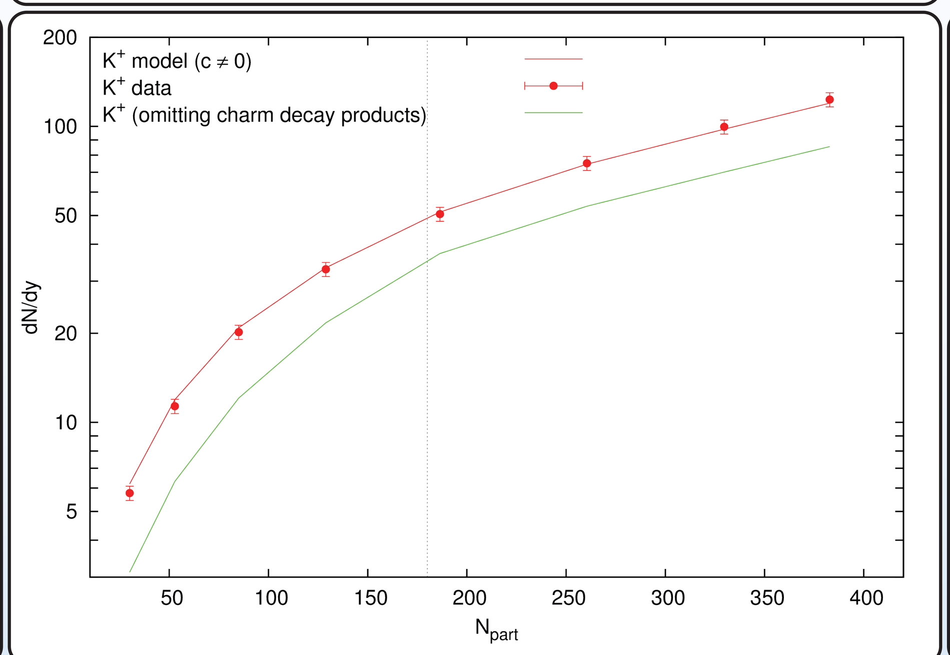


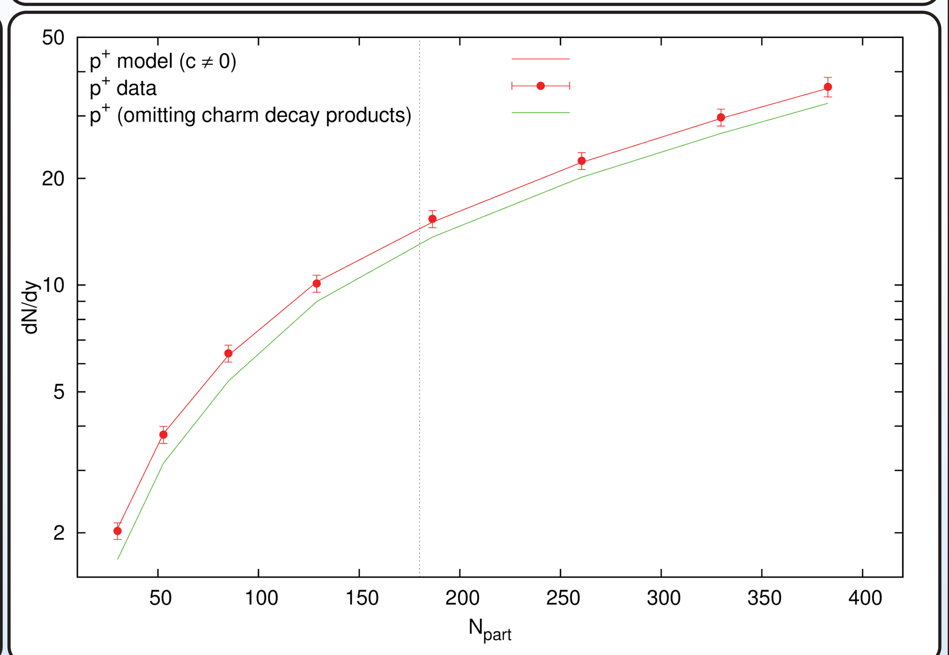


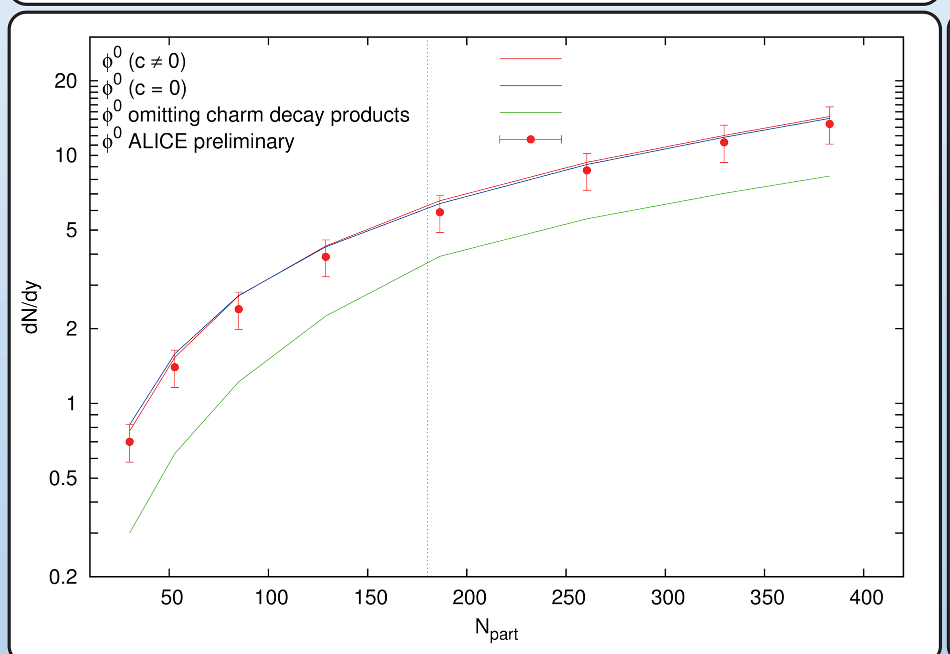


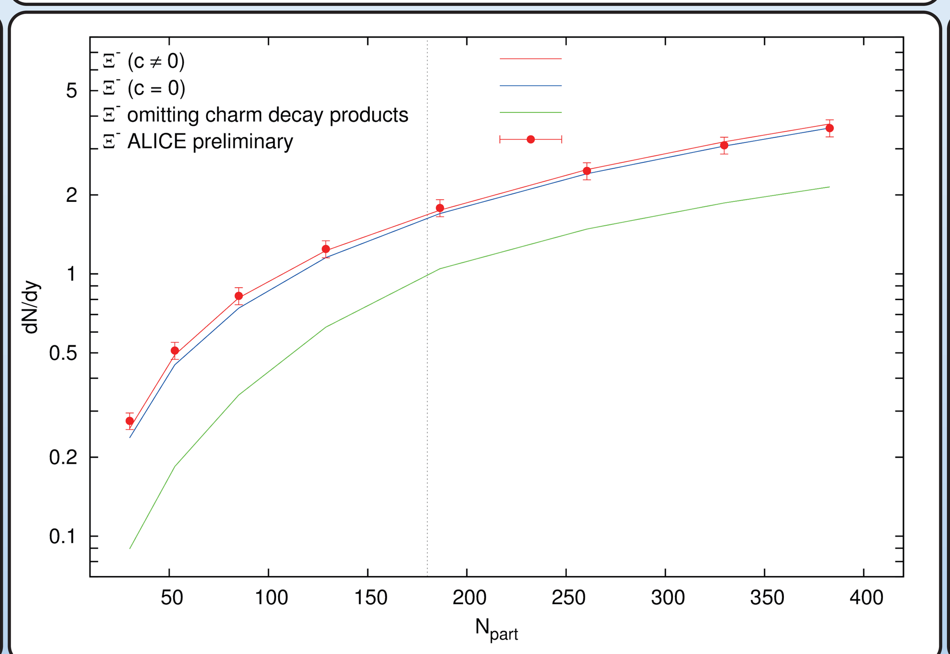


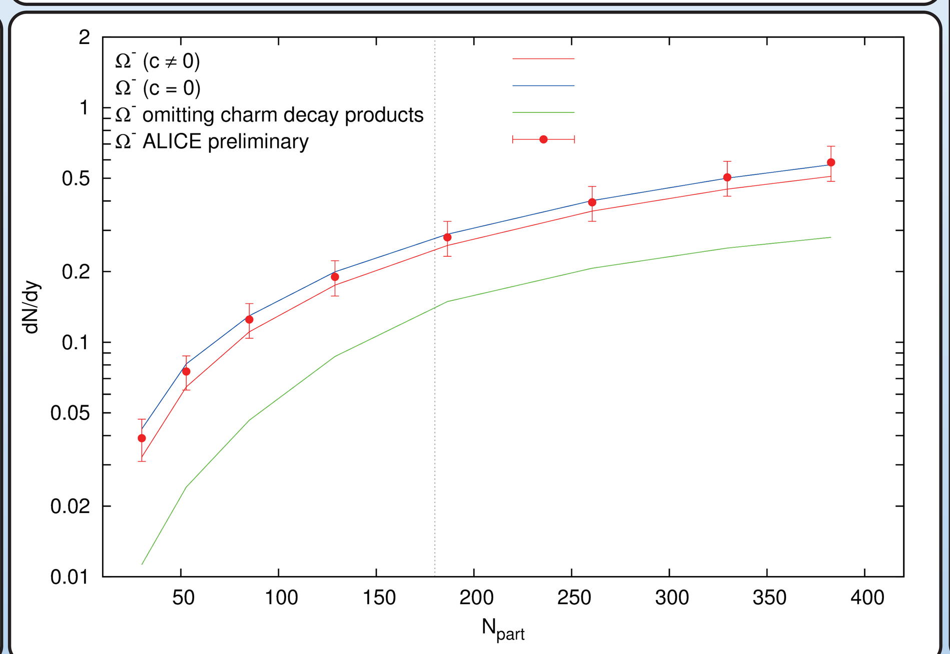










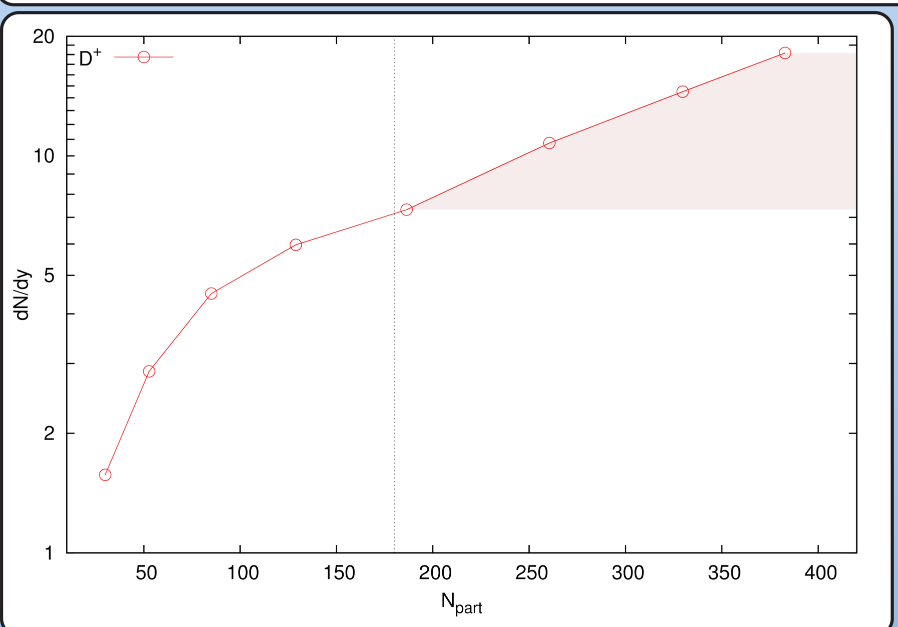


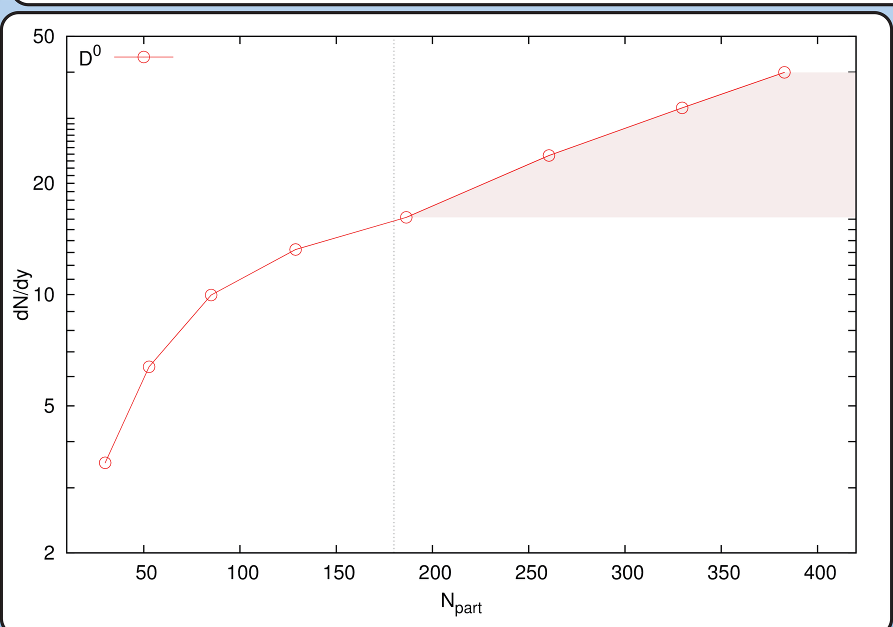
Including charm-feed to all soft hadrons at LHC energies is necessary because it accounts for 10-50% of the yield of e.g. (multi)strange particles, see green lines.

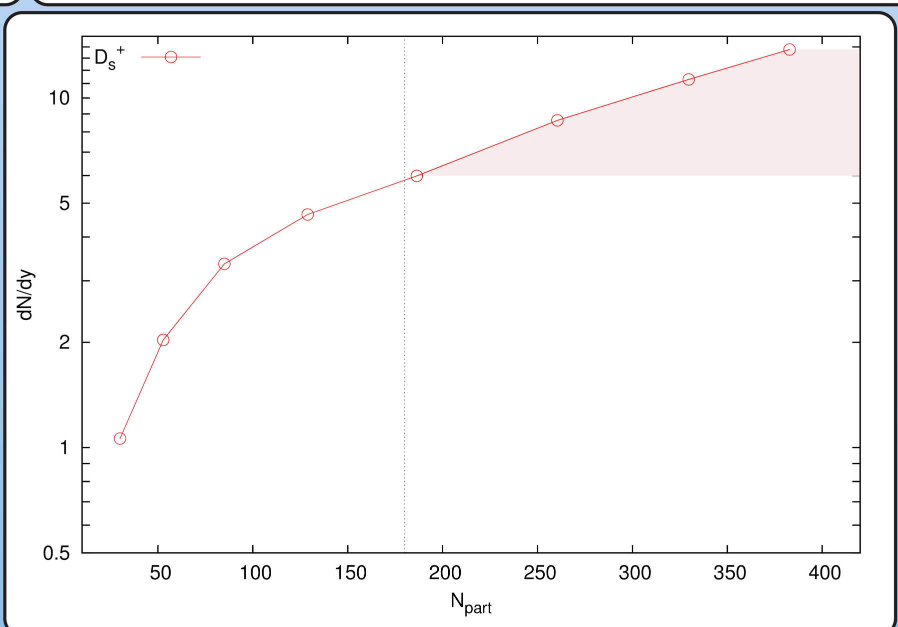
Major code development was necessary to describe charm hadronization and decay, "SHARE with CHARM" now includes multiparticle charm decays compatible with PDG 2011.

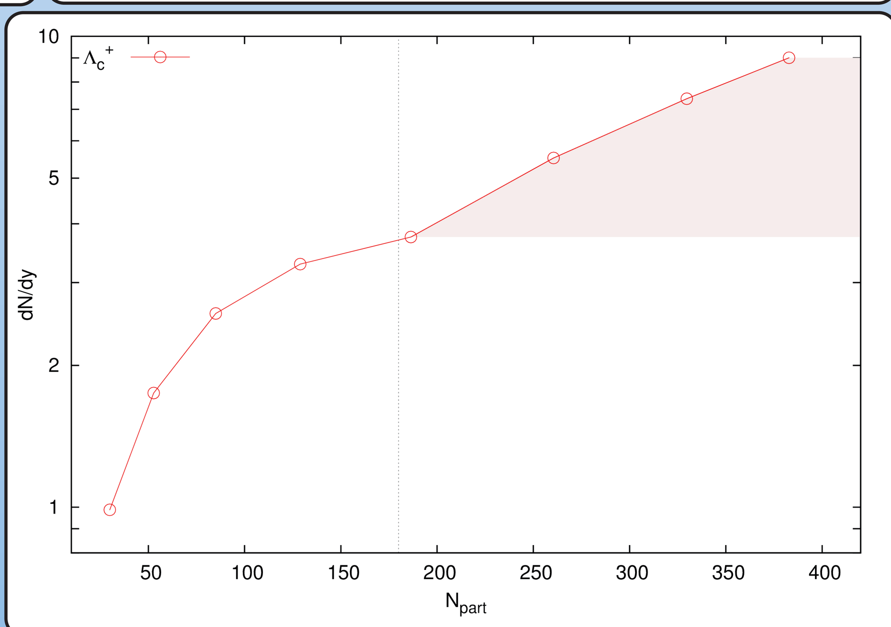
Charm hadronizes conserving the yield. The inclusion of charm-decay produced soft hadrons causes stat-had fit parameters to vary only slightly compared to fit without charm (see also poster 319, stand 300) and in expected way. However where a fit describes charm χ^2 improved for the peripheral region more than factor 2. However, where fit previously had χ^2=0 in central region, addition of constraints increases χ^2 by a small amount

This approach allows us to predict also charm particle yields, see bottom. Only a small fraction of charm is bound in charmonium states. In the central domain the prediction has a wide range due to uncertainty in the value F=3 or 4 .









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