J/Ψ SUPPRESSION IN THE THRESHOLD MODEL

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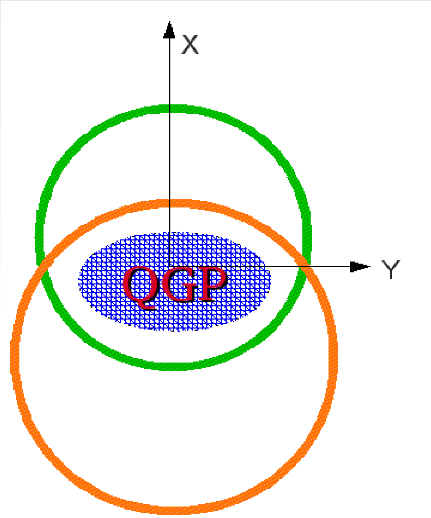
February 26, 2009

PRODUCTION IN THE THRESHOLD MODEL

The hadron production in the two regions is determinated by the properties of the medium. **Blaizot et al NPA 610, 452C (1996).**

In the QGP region:

$$\frac{d^2\sigma_{Part}^{QGP}}{d^2b}=c\left[\int n_p(\boldsymbol{s},\boldsymbol{b})\theta\left(n_p(\boldsymbol{s},\boldsymbol{b})-n_c\right)d^2s\right]^2$$



And in ONM:

$$\frac{d^2\sigma_{Part}^{ONM}}{d^2b}=\sigma_{Part}^{NN}\int T_B(\boldsymbol{b}-\boldsymbol{s})T_A(\boldsymbol{s})\theta\left(n_c-n_p(\boldsymbol{s},\boldsymbol{b})\right)d^2s$$

The transverse density of participants is defined as.

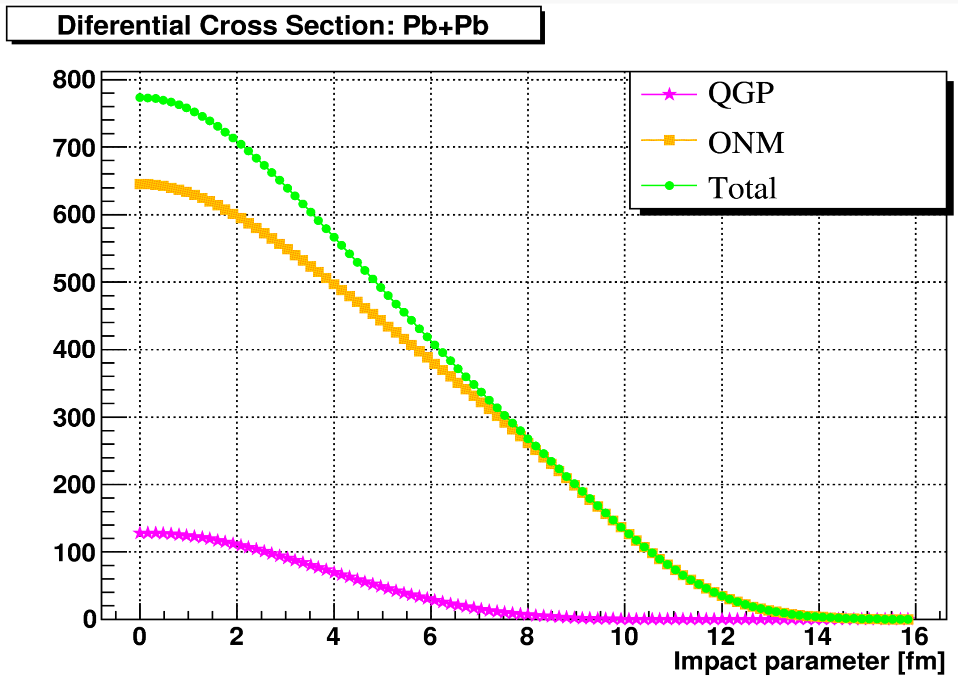
$$n_p(\boldsymbol{s},\boldsymbol{b})=T_A(\boldsymbol{s})\left\{1-\exp\left[-\sigma^{NN}T_B(\boldsymbol{b}-\boldsymbol{s})\right]\right\}+T_B(\boldsymbol{b}-\boldsymbol{s})\left\{1-\exp\left(-\sigma^{NN}T_A(\boldsymbol{s})\right)\right\}$$

HADRON PRODUCTION OF s & c

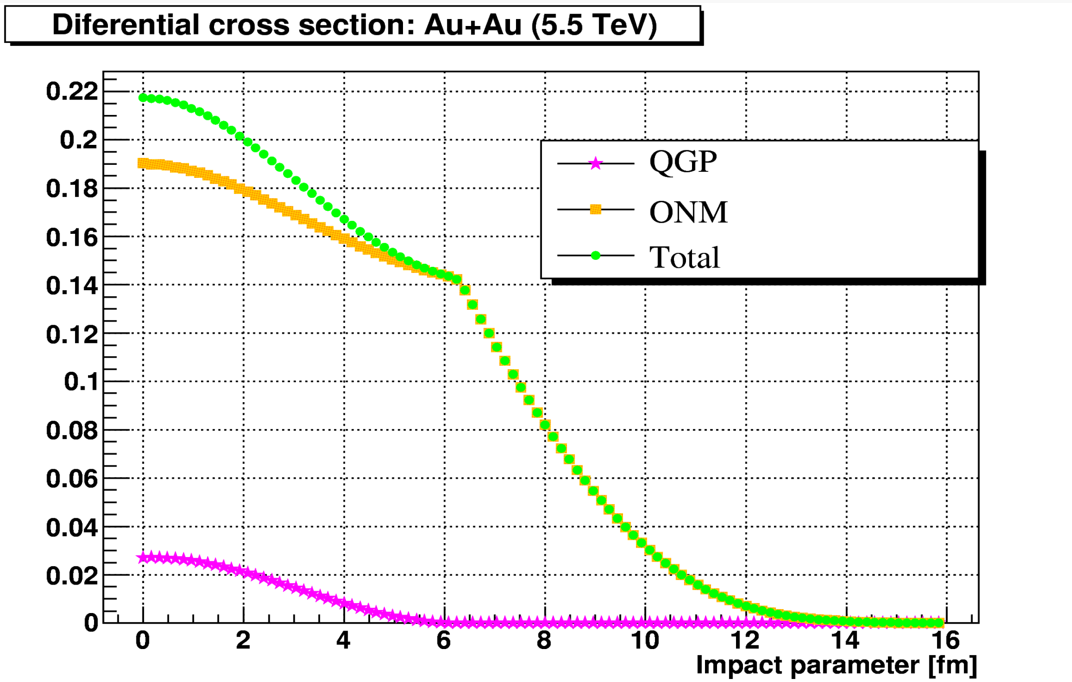
The particle production is clearly effected by the medium. Whether it is produced in the QGP or not.

The QGP region depends directly of the impact parameter.

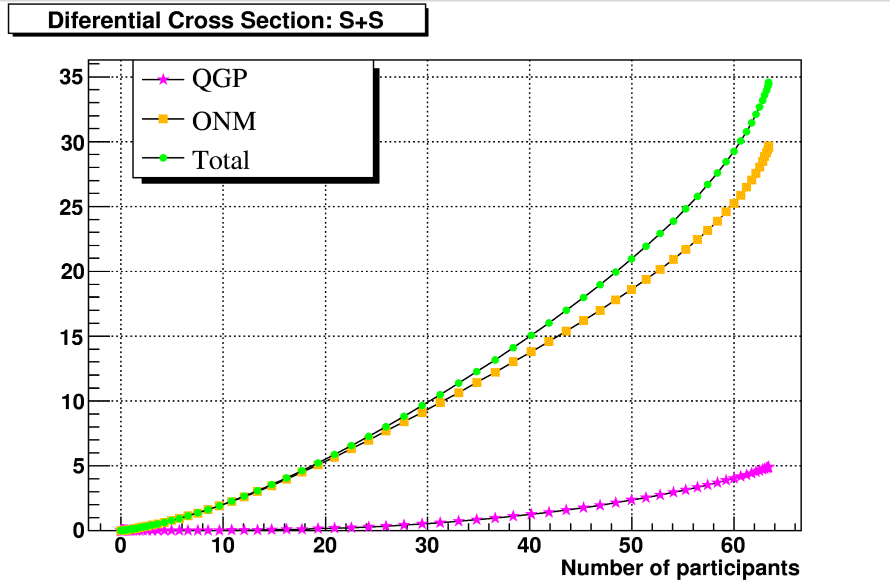
$\Lambda^0\,(u\;d\;s)$

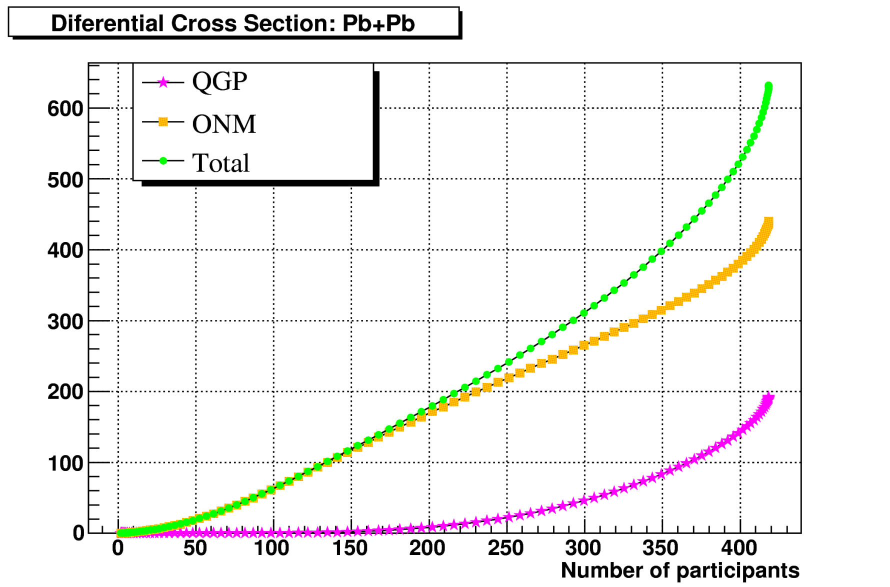


$J/\Psi\;(c\,\bar{c})$



Λ^0 Production as function of number of participants





Production depends on the number of participants, $N_p(\mathbf{b})$, which are those nucleons that have at least one collision. **Miller et al, ARNPS. 57, 205 (2007).**

This is related to the centrality.

E_T-depended production

The ***transverse energy*** of the collision is defined as the total energy emitted in the form of hadrons in a plane orthogonal to the beam axis. **Kharzeev et al, ZPC. 74, 307 (1997).**

It is assumed that a *fluctuation* in the **local energy density ϵ** in the interaction zone will produce a *fluctuation* in the **transverse energy (E_T)**. **Blaizot et al. PRL. 85, 4012 (2000).**

Now the production depends on the local energy density, which is given by:

$$\epsilon \propto \frac{E_T}{<E_T>} n_p$$

Where $<E_T>$ is the mean transverse energy.

The proposed distribution has a Gaussian behavior. **Kharzeev et al, ZPC. 74, 307 (1997).**

$$P(E_T|\boldsymbol{b}) = \frac{1}{\sqrt{2\pi q^2 N_p(\boldsymbol{b})}} \exp\left\{ \frac{-[E_T - qN_p(\boldsymbol{b})]^2}{\text{٢} q^{\text{٢}} a N_p(\boldsymbol{b})} \right\}$$

The ***q*** and ***a*** constants are obtained from the fit of the experimental data. The values were extracted by the NA50 data in 1.1<y<2.3: **Blaizot et al. PRL. 85, 4012 (2000)**.

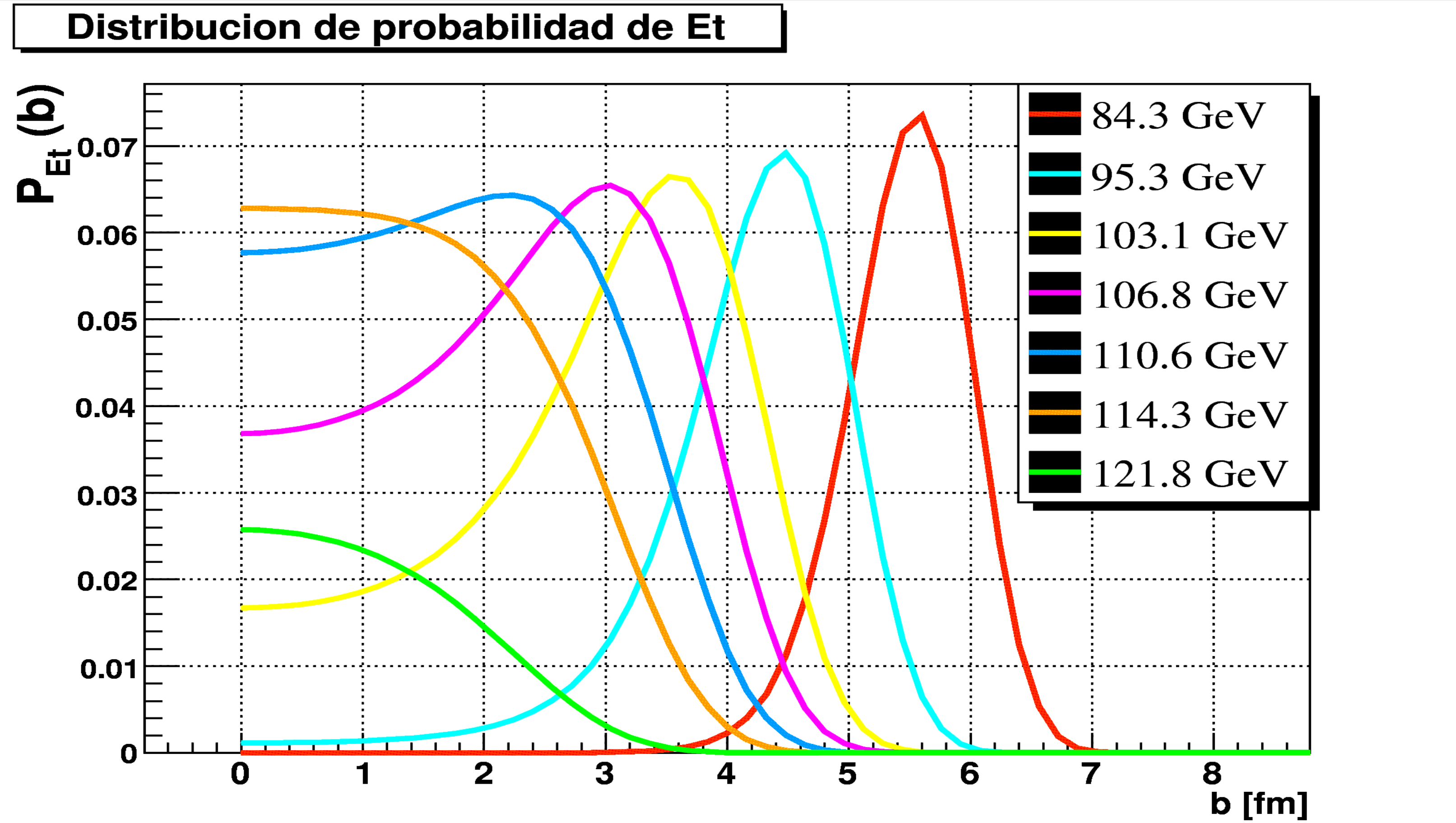
q = 0.274 GeV & **a = 1.27**.

$<E_T>$ is expressed by: $<E_T> = qN_p(\boldsymbol{b})$.

The correlation in **b** and E_T is not one by one. The larger the E_T the more central the collision.

Probability distribution of E_T

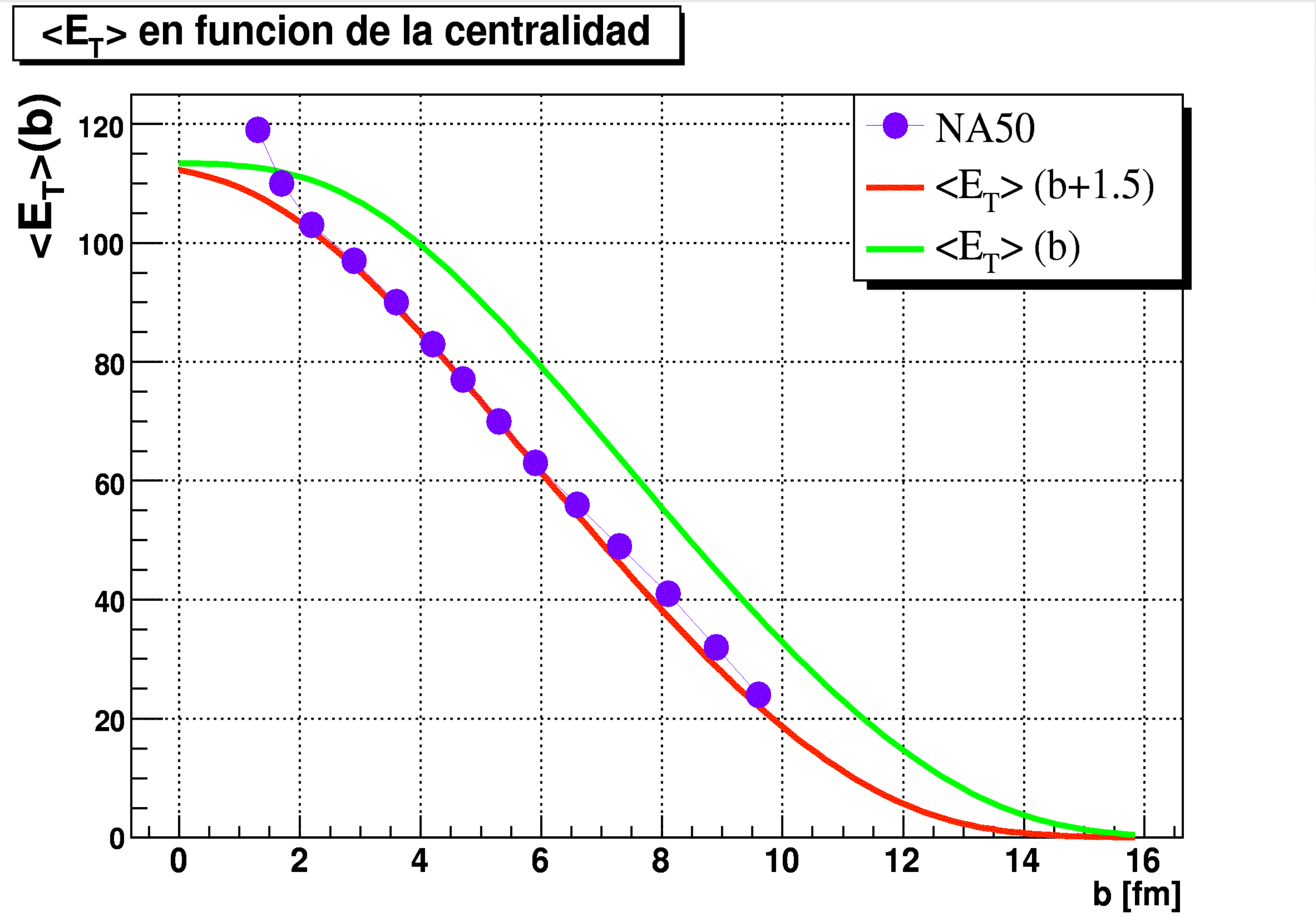
The distribution becomes more **asymmetric** at E_T values higher than 95.3 GeV**!!!** **Where does this asymmetry come from?** **Many assumptions** **Kharzeev et al, ZPC. 74, 307 (1997).**



Mean Transverse Energy as function of impact parameter

Model: $<E_T>(\mathbf{b}) = qN_p(\mathbf{b})$.

Experiment: $<E_T>(\mathbf{b}) \rightarrow <E_T>(\mathbf{b} + 1.5)$.



The **hadron production in function of the transverse energy** is expressed in the *Glauber Model* calculation:

$$\frac{d\sigma_{AB}^{part}}{dE_T} = \sigma_{NN}^{part} \int d^2\boldsymbol{b}\, T_{AB}\, P(E_T | \boldsymbol{b})$$

Using the *Threshold Model* in the J/Ψ production, we have the following expression. **Chaudhuri, JPG 32, 229 (2006).**

$$\frac{d\sigma^{J/\Psi}}{dE_T} = \sigma_{NN}^{J/\Psi} \int d^2\boldsymbol{b}\, d^2\boldsymbol{s}\, T_A^{eff}(\boldsymbol{b}) T_B^{eff}(\boldsymbol{b}-s)\, \Theta\left(\frac{E_T}{<E_T>} n_p(\boldsymbol{b},\boldsymbol{s}) - n_c\right) P(E_T | \boldsymbol{b})$$

Where $\boldsymbol{T^{eff}}$ is the effective thickness function.

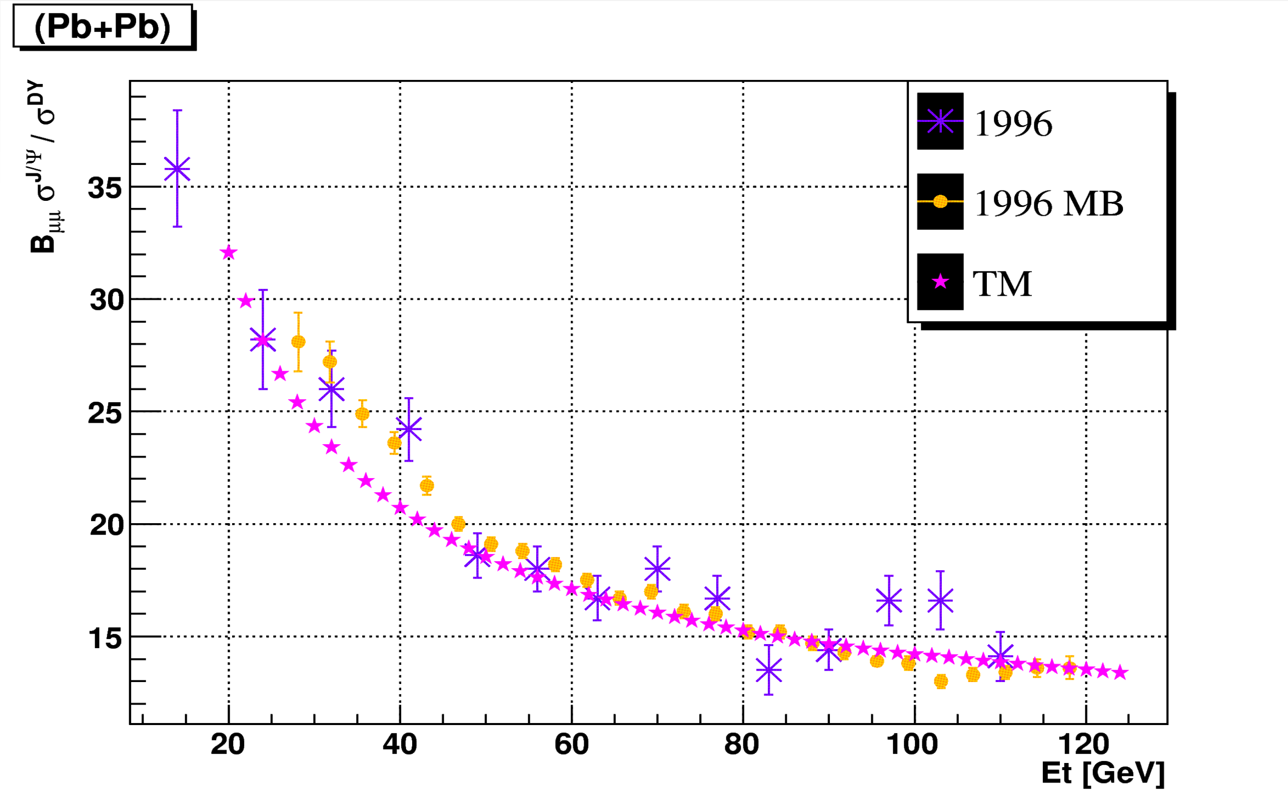
$$T^{eff} = \int_{-\infty}^{\infty} dz\, \rho(\boldsymbol{b}, z) \exp\left(-\sigma_{\mathrm{abs}}^{J/\Psi} \int_z^{\infty} dz'\, \rho(\boldsymbol{b}, z')\right)$$

$\sigma_{\mathrm{abs}}^{J/\Psi}$ is the J/Ψ absorption cross section in a collision against a nucleon.

J/Ψ suppression: J/Ψ over Drell-Yan process

The NA50 detects the channel $\mu^+\mu^-$. The J/Ψ and Drell-Yan process produce this channel. The comparison of J/Psi to DY is because DY is not affected to final interaction states.

The data is normalized to: $B_{\mu\mu}\frac{\sigma_{NN}^{J/\Psi}}{\sigma_{NN}^{DY}}=38$ **Chaudhuri, JPG 32, 229 (2006).**



$$13\left\{B_{\mu\mu}\frac{\sigma^{J/\Psi}(E_T)}{\sigma^{DY}(E_T)}\right\}+10$$

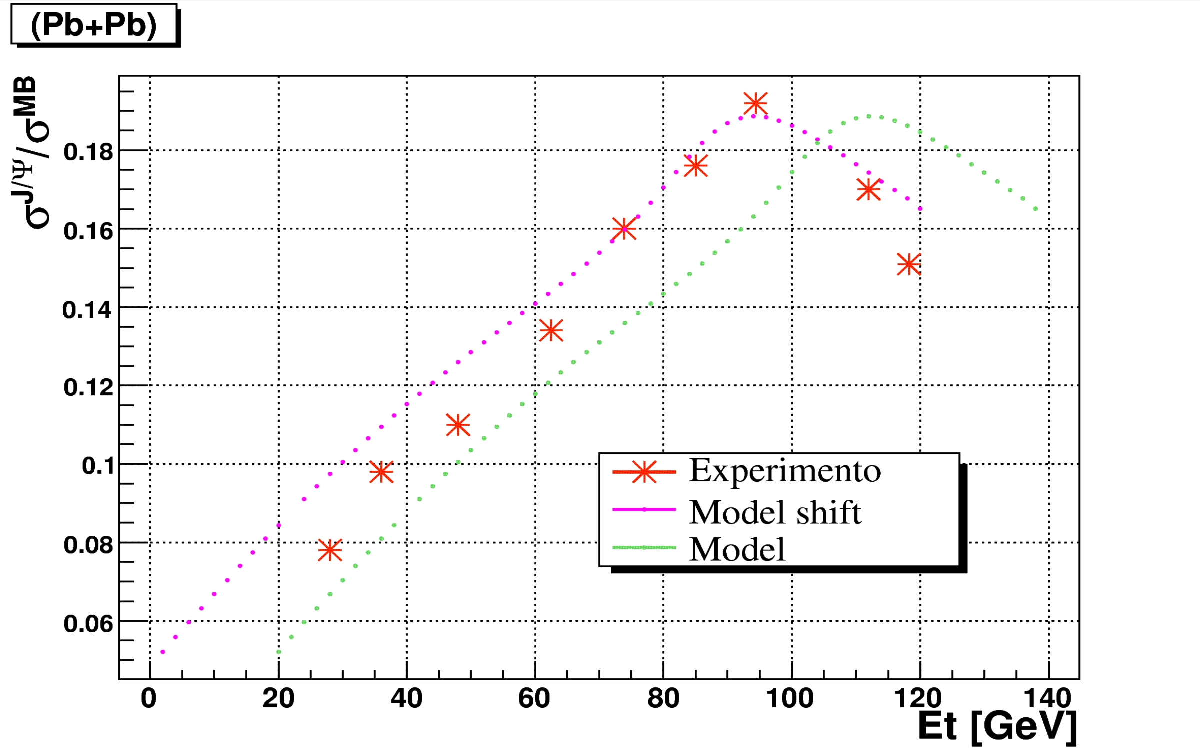
J/Ψ suppression: J/Ψ over MB

Minimum Bias is considered as the probability to have at least one collision at impact parameter **b**. **Blaizot et al. PRL. 85, 4012 (2000).**

$$P(MB|\boldsymbol{b}) = 1 - \exp[-\sigma_{NN} T_{AB}(\boldsymbol{b})]$$

$$\Rightarrow \quad \frac{d\sigma_{AB}^{MB}}{dE_T} = \int d^2\boldsymbol{b} \{1 - \exp[-\sigma_{NN} T_{AB}(\boldsymbol{b})]\} P(E_T|\boldsymbol{b})$$

$$\frac{1}{11}\left\{\frac{\sigma^{J/\Psi}(E_T-20)}{\sigma^{MB}(E_T-20)}\right\}$$



Conclusions

- We have presented the cross section production for Λ^0 and J/Ψ:
  - As function of impact parameter
  - As function of number of participants

- Energy fluctuation has been taking into account for the production (It is observed that can explain the data, not for central collisions)

- J/psi suppression was calculated in the threshold model:
  - Comparison with D-Y
  - Comparison with MB

Things to do

- Improve P(Et,b) for the central collision
- The cross section could be analyzed vs pt instead of Et
- Repeat the same calculations for LHC energy.