B_c meson hadroproduction in k_T-factorization approach

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Introduction

Nowadays the experimental search for B_c mesons is carried out at the CERN e^+e^- collider LEP [1] and at the Fermilab Tevatron $p\bar{p}$ collider [2].

The hadronic production of the B_c and $B_c^\star$ mesons have been calculated in the parton model using different approaches:

1. Fragmentation model [3,4,5,6]
2. Fusion model [3,4,7]
3. Charm excitation [7]

$m_{B_c} = m_b + m_c$.

$m_b = 5.1$ GeV, $m_c = 1.5$ GeV.

$f_{B_c} = 560$ MeV.

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[1] K. Ackerstaff et al. (OPAL Coll.), CERN-PRE-97-137 (1997).

[2] F. Abe et al. (CDF Coll.), FERMILAB-Conf-95/202-E (1995).

[3] S.S. Gershtein, V.V. Kiselev, A.K. Likhoded, A.V. Tkabladze, A.V. Berezhnoy and A.I. Onishchenko, IHEP-98-22 (1998).

[4] K. Kolodziej, R. Rückl, Nucl.Instrum.Meth. **A408** (1998) 33.

[5] K. Cheung and T.C. Yuan, Phys.Rev. **D53** (1996) 1232.

[6] C.-H. Chang, Y.-Q. Chen and R.J. Oakes, Phys.Rev. **D54** (1996) 4344.

[7] S.P. Baranov, Phys.Rev. **D56** (1997) 3046.

The k_T-factorization approach

In the parton model:

$$\sigma^{\rm PM}(p\bar{p} \to b\bar{b}X, s) = \int dx_1 G(x_1, \mu^2) \times$$
$$\times \int dx_2 G(x_2, \mu^2) \hat{\sigma}(gg \to b\bar{b}, \hat{s}), \qquad (1)$$

$$p_{g,i} = x_i p_{p,i},\ \hat{s} = x_1 x_2 s.$$

In the k_T-factorization approach [7,8]:

$$\sigma^{\rm KT}(p\bar{p} \to b\bar{b}X, s) =$$
$$= \int \frac{dx_1}{x_1} \int d\vec{k}_{1T}^2 \int \frac{d\varphi_1}{2\pi} \Phi(x_1, k_{1T}^2, \mu^2) \times$$
$$\times \int \frac{dx_2}{x_2} \int d\vec{k}_{2T}^2 \int \frac{d\varphi_2}{2\pi} \Phi(x_2, k_{2T}^2, \mu^2) \times$$
$$\times \hat{\sigma}(g^\star g^\star \to b\bar{b}, \vec{k}_{1T}^2, \varphi_1, \vec{k}_{2T}^2, \varphi_2, \hat{s}) \qquad (2)$$

$$p_{g,i} = x_i p_{p,i} + k_{i,T},\ \hat{s} = x_1 x_2 s - \vec{k}_{1T}^2 - \vec{k}_{2T}^2,$$
$$k_{i,T} = (0, \vec{k}_{i,T}, 0).$$

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[7] L.V. Gribov, E.M. Levin and M.G. Ryskin, Phys.Rep. **100** (1983) 1.

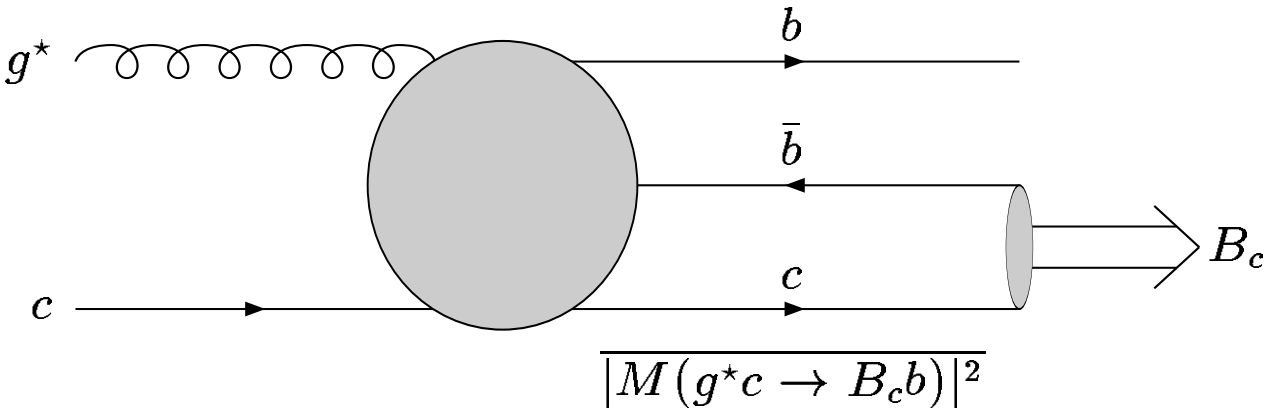
[8] E. Kuraev, L. Lipatov, and V. Fadin, Sov.Phys.JETP **44** (1976) 443;

Y. Balitskii and L. Lipatov, Sov.J.Nucl.Phys. **28** (1978) 822.

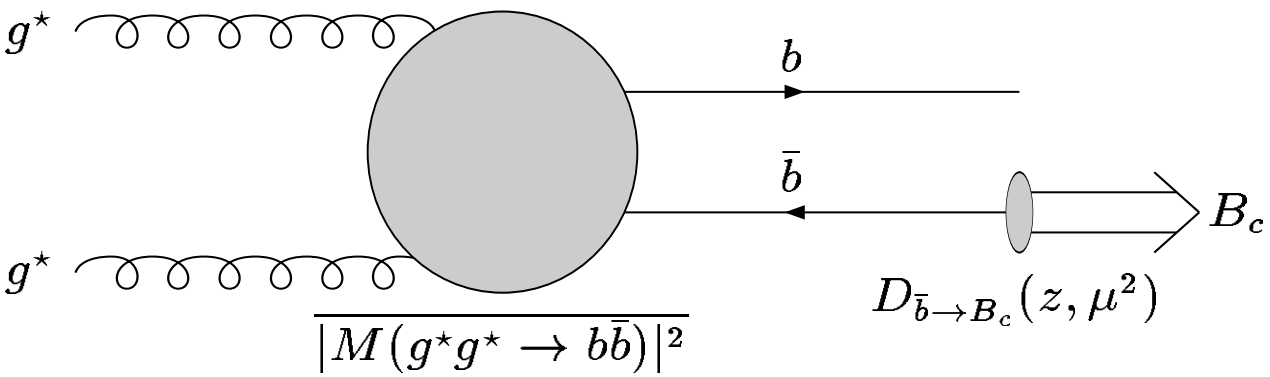
The B_c-meson production

In the kinematic region under consideration: $m_c \ll m_{B_c}$ and $m_c \ll p_T$, and we use two approaches for B_c-meson production:

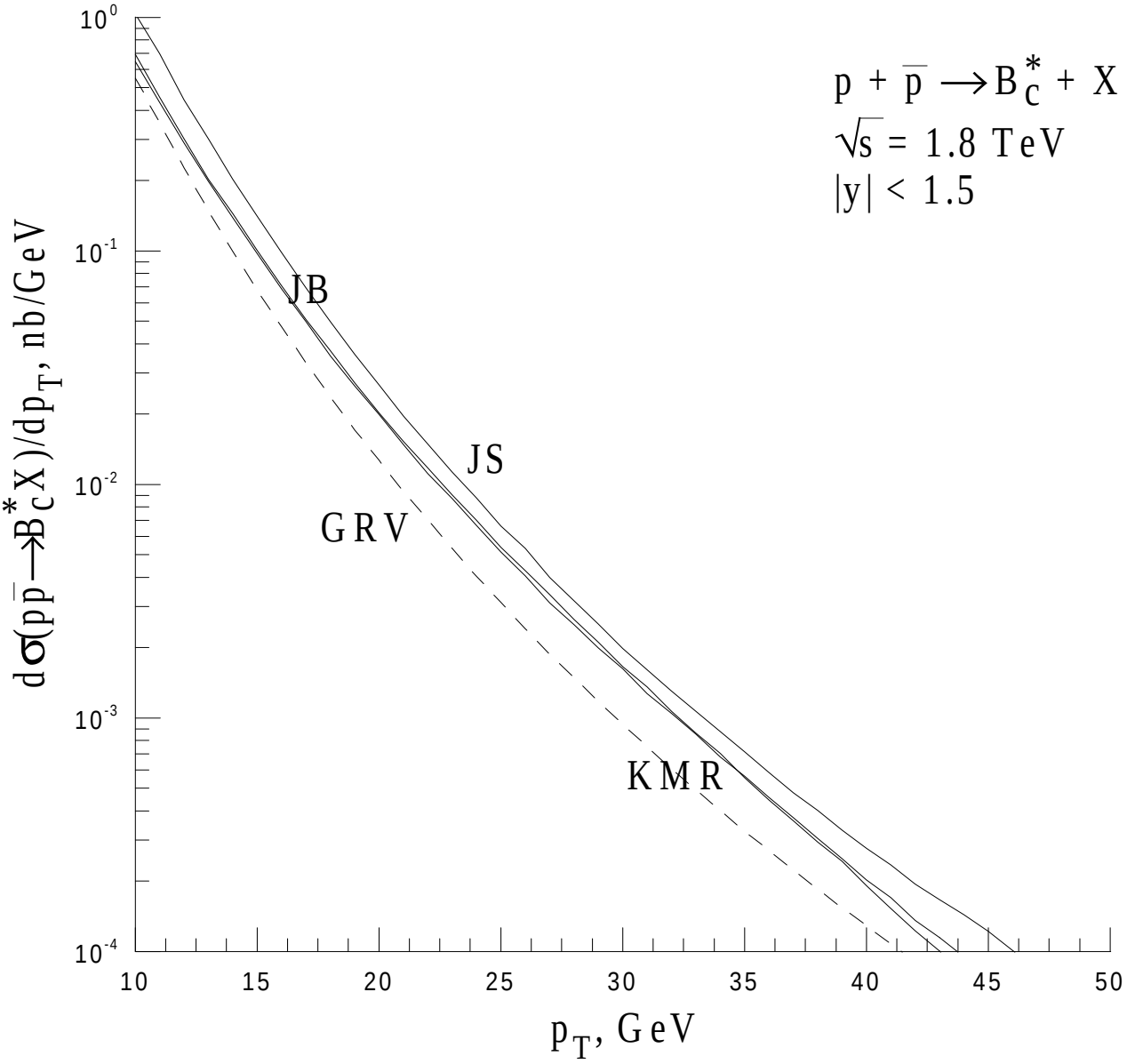
1. The B_c-meson production in the fusion model with charm excitation in a proton



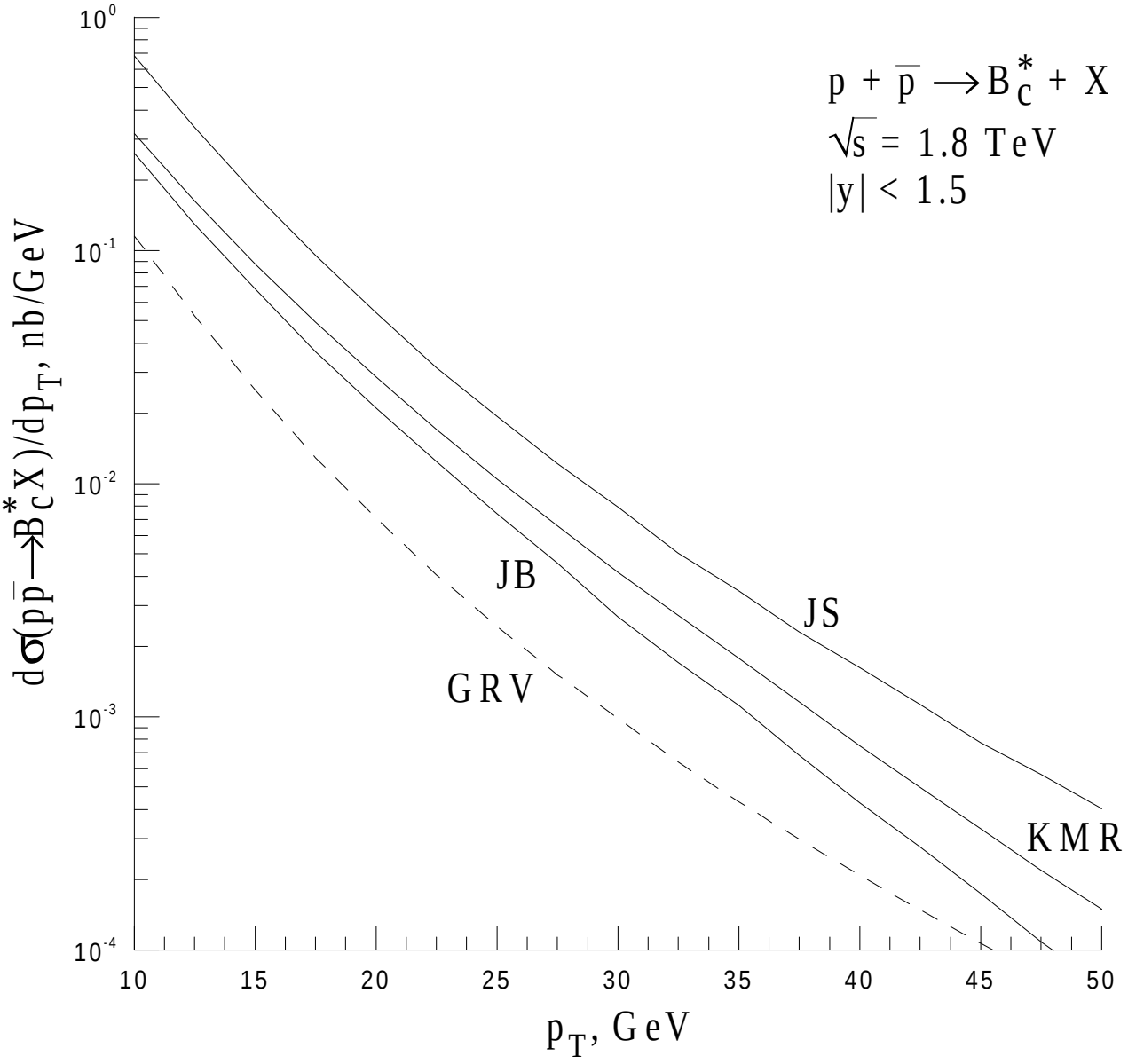
2. The B_c-meson production in the fragmentation approach



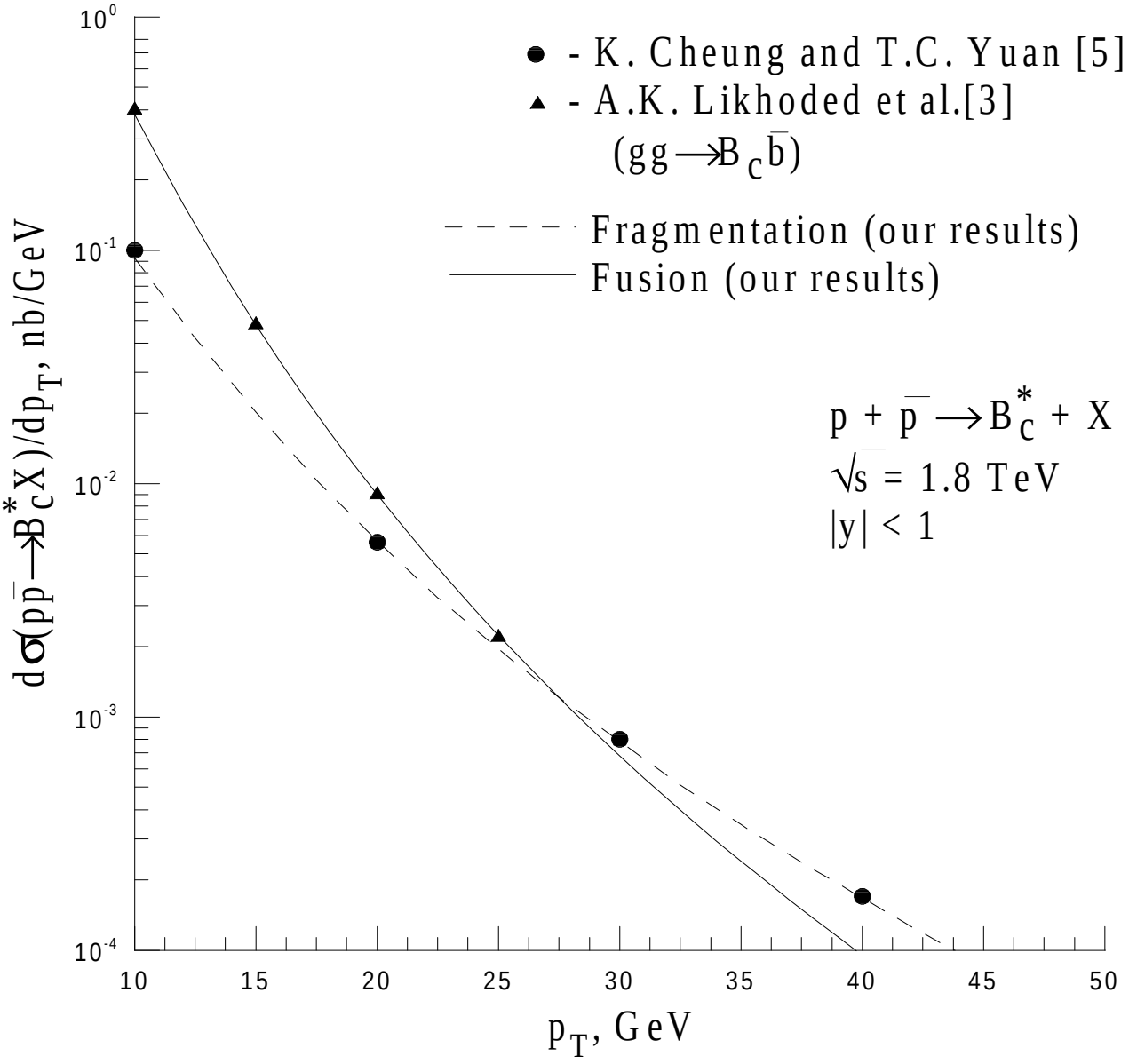
The B_c-meson production in the fusion odel with charm excitation in a proton



The B_c-meson production in the fragmentation approach



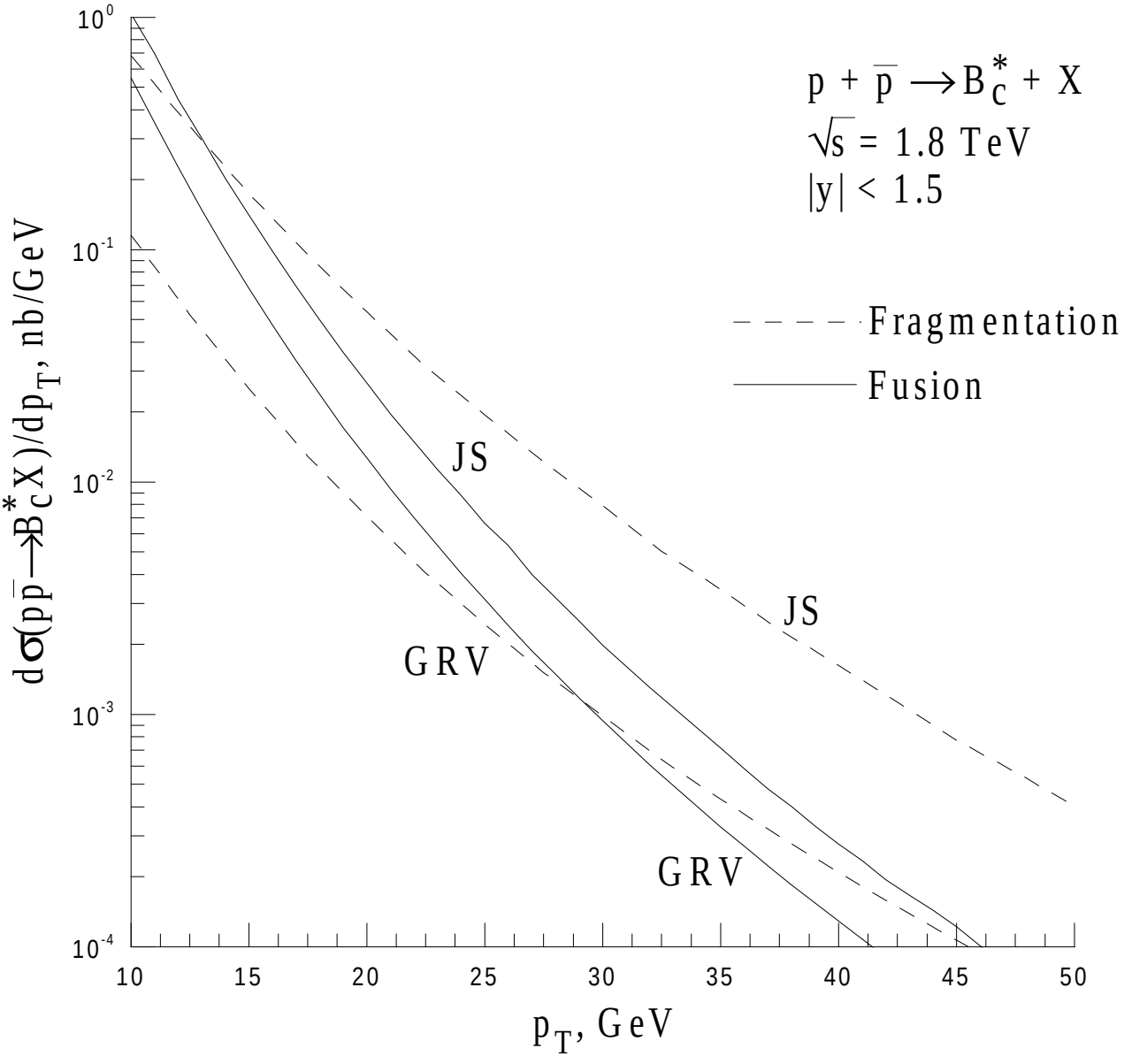
Comparison with previous calculations in parton model



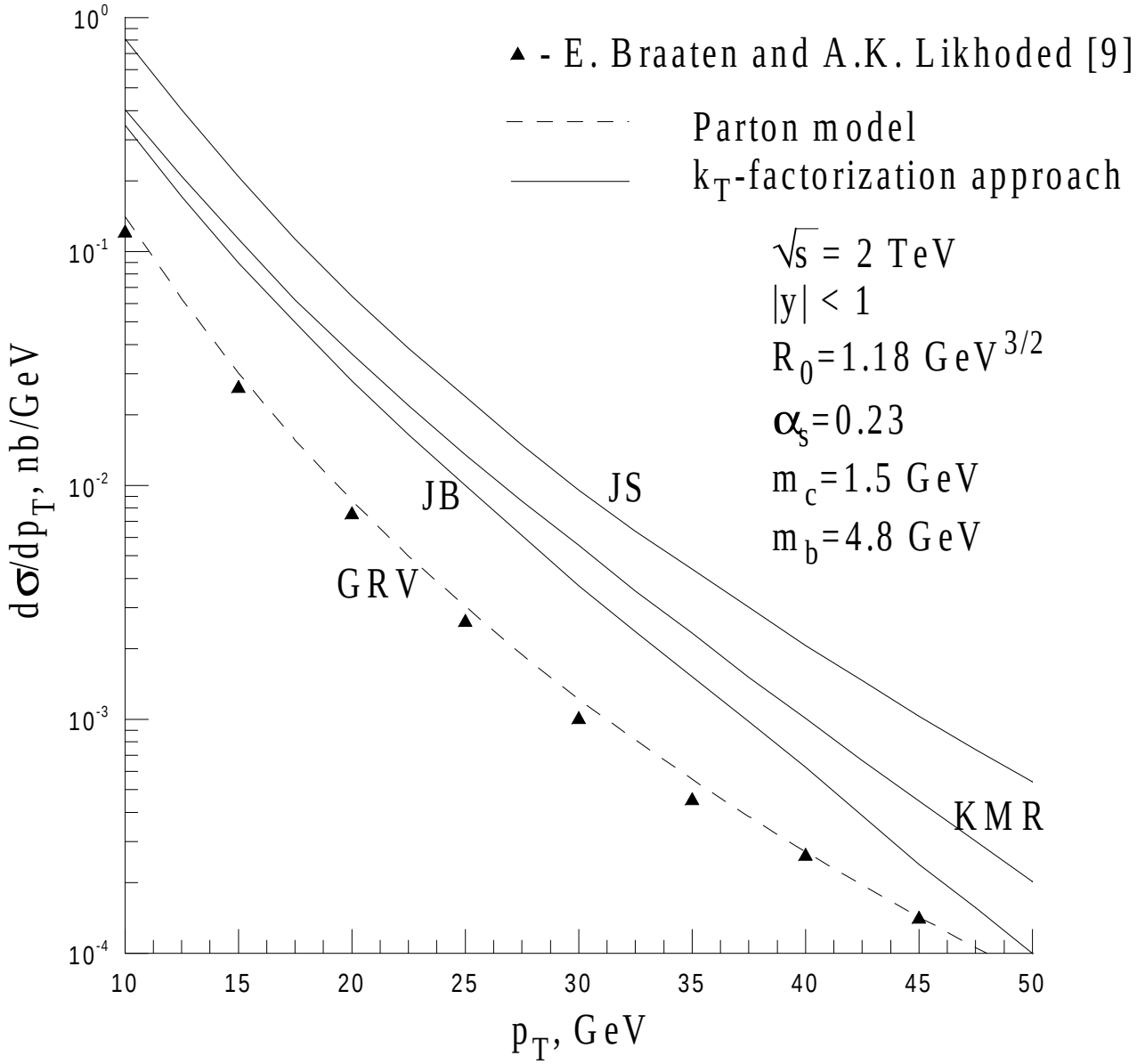
[3] S.S. Gershtein, V.V. Kiselev, A.K. Likhoded, A.V. Tkabladze, A.V. Berezhnoy and A.I. Onishchenko, IHEP-98-22 (1998).

[5] K. Cheung and T.C. Yuan, Phys.Rev. **D53** (1996) 1232.

Comparison two approaches: fragmentation and fusion



Comparison B_c and $B_c^\star$ meson production with previous calculations in parton model and Tevatron data



B_c meson cross section ($p_T > 6$ GeV, $|y| < 1$):
$\sigma_{PM} = 2.5$ nb [9]
$\sigma_{exp} \sim 10 \pm 6$ nb [10]
$\sigma_{KT} \sim 6$ nb (JB, KMR)
$\sigma_{KT} \sim 10$ nb (JS)

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[9] K. Anikeev at al., FERMILAB-Pub-01/197 (2001) 480.

[10] F. Abe at al., CDF Coll., Phys.Rev.Lett. **81** (1998) 2432;
F. Abe at al., CDF Coll., Phys.Rev. **D58** (1998) 112004.