

(Uncertainty of) Interpolation of FONLL predictions for b and c at LHC

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(Probably as close as one can get to metaphysics...)

Perhaps we should first agree on the energy?

- 15:00 - 19:00 Discussion on interpolation from pp data @ 7TeV to pp @ 2.75 TeV
Convener: Ermanno Vercellin (Universita degli Studi di Torino-Universita e INFN)
- 15:00 **Interpolation of quarkonia calculations at LHC 30'**
Speaker: Jean-Philippe Lansberg (Ecole Polytechnique)
- 15:35 **Interpolation of FONLL predictions for c and b at LHC 30'**
Speaker: Matteo Cacciari (LPTHE Jussieu)
- 16:10 **Pt extrapolation to LHC energies 30'**
Speaker: Alessandro De Falco (Univ. + INFN Cagliari)
- 16:40 **Coffee break 20'**
- 17:00 **Phenomenological interpolation to 2.76 TeV 30'**
- 17:35 **Rescaling of J/psi cross section from 7 to 2.75 TeV 30'**
Speaker: Martino Gagliardi (Universita degli Studi di Torino)
- 18:10 **Discussion 50'**

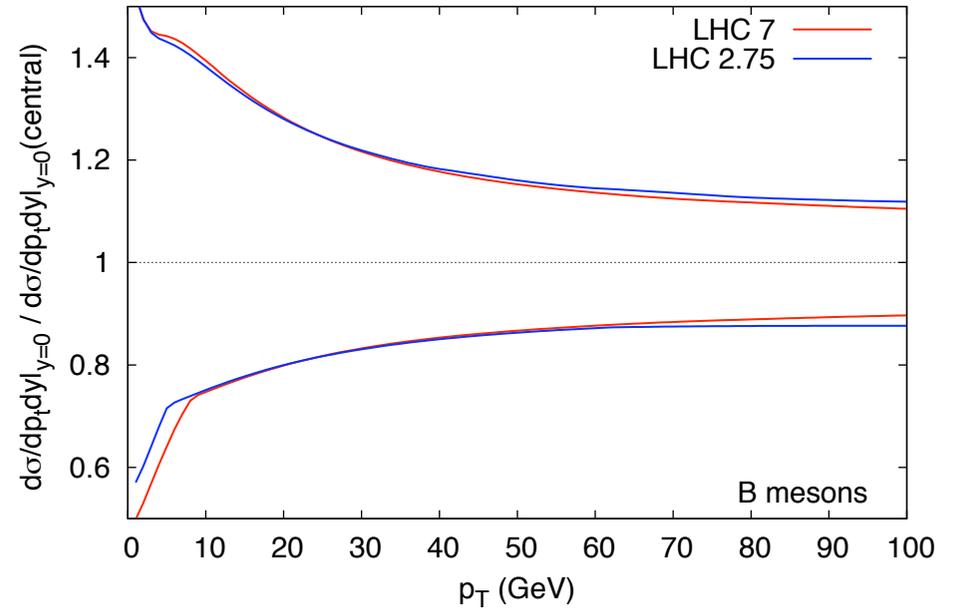
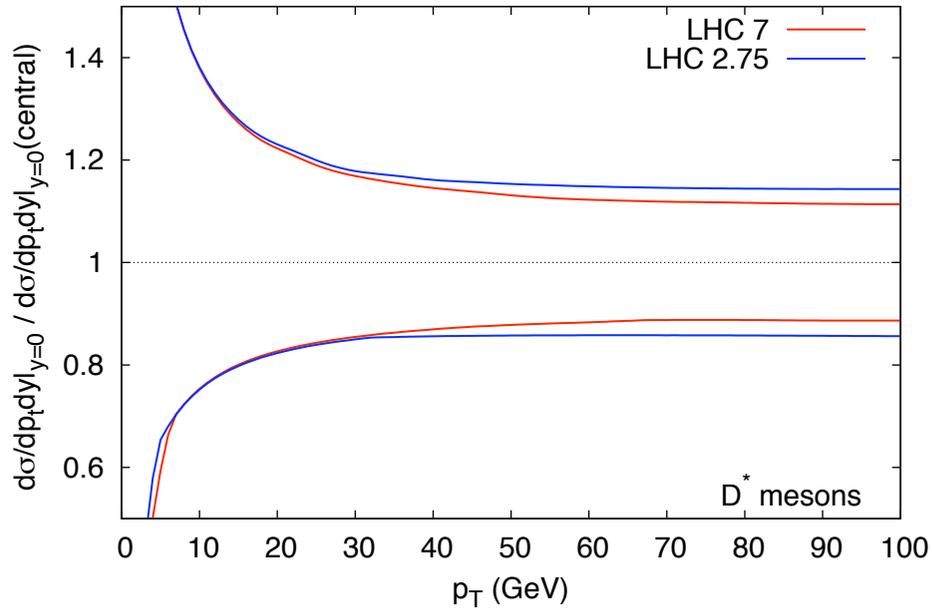
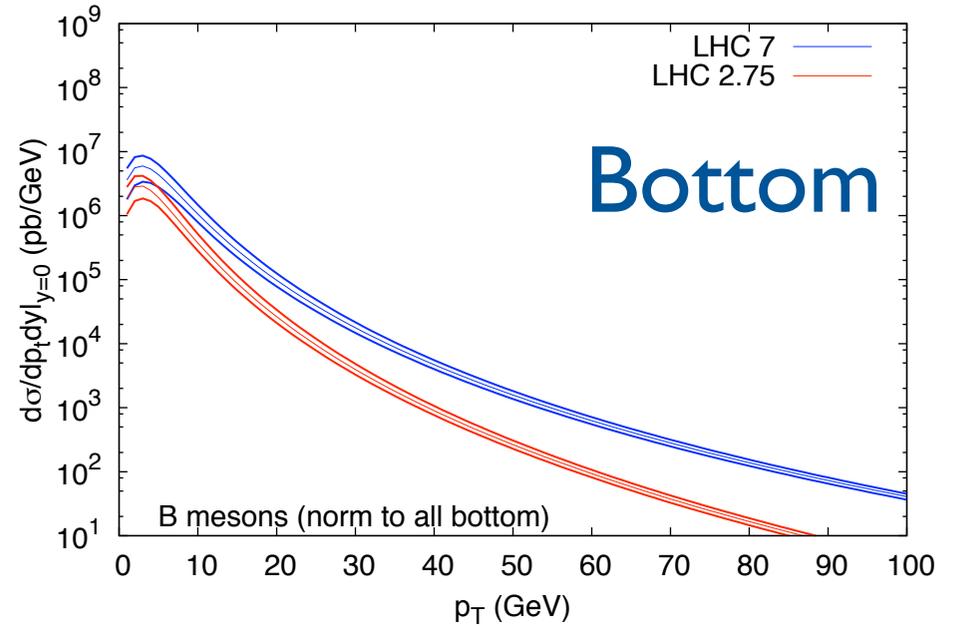
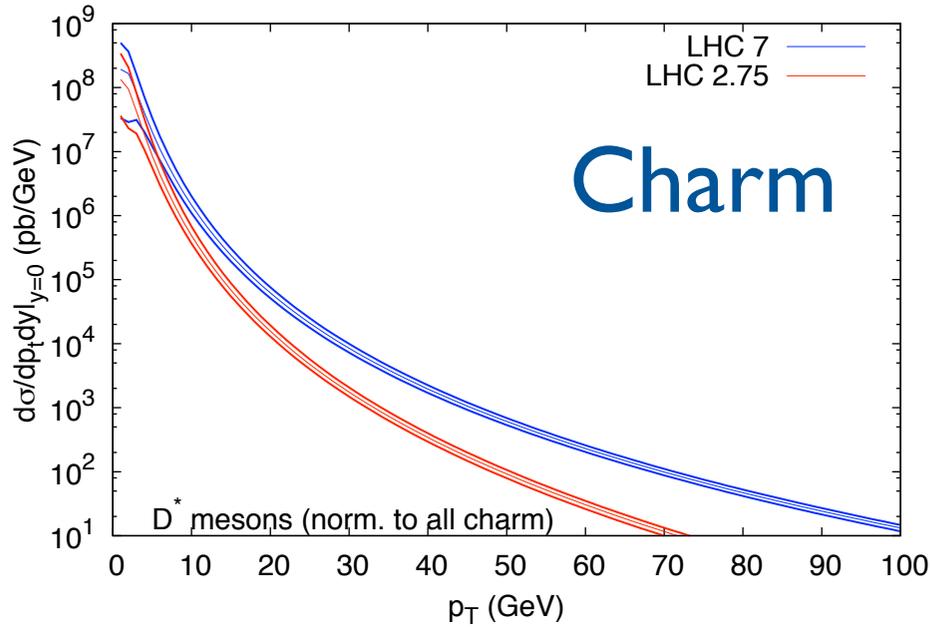
Not that it matters, of course...

Consider, for definiteness,

$$\frac{d\sigma}{dp_t dy} \Big|_{y=0}$$

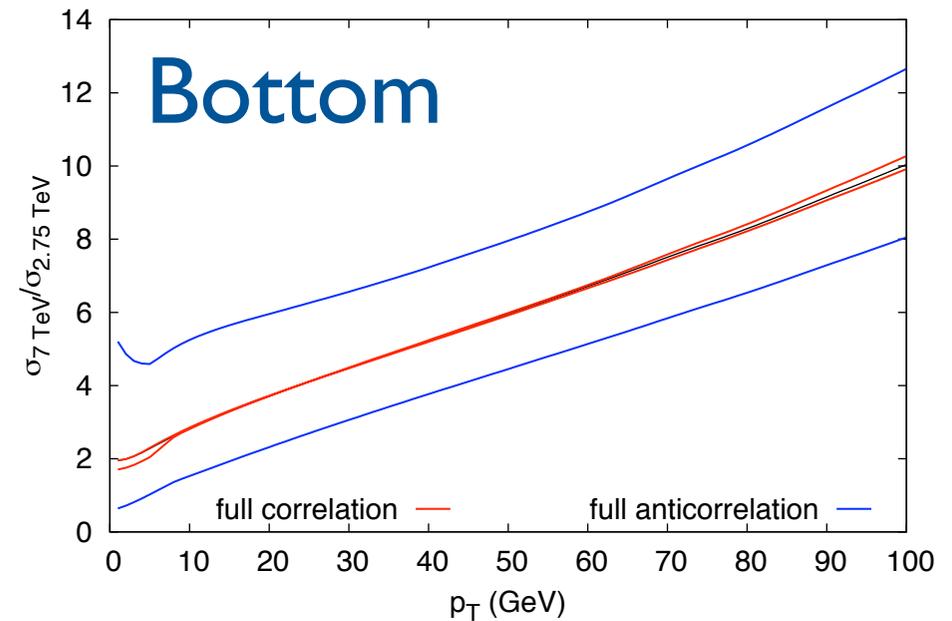
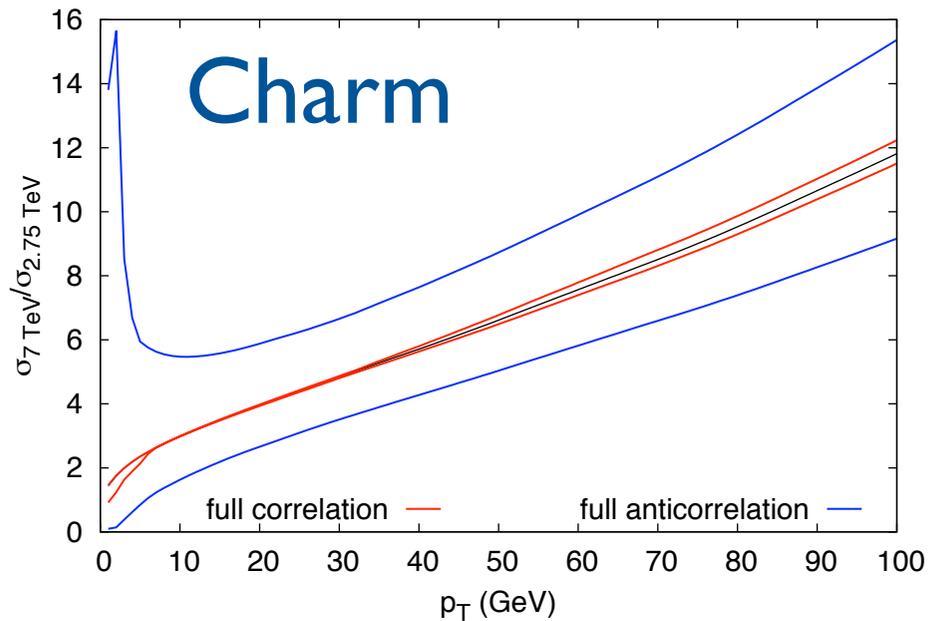
(We'll use the FONLL predictions for hadrons, more specifically B and D* mesons)

FONLL differential distributions



The 7 TeV/2.75 TeV ratios can be calculated

- ▶ Using the 'central' curves only
- ▶ Using the bands, and pairing the scales 'up-up' and 'down-down'
- ▶ As above, but maximizing the uncertainty: 'up-down' and 'down-up'



What do we believe?

- ▶ The central curve?
- ▶ The band with *fully correlated* scales?
- ▶ The band with *fully anticorrelated* scales?
- ▶ Anything in between?

The scales dilemma

No theorem tells us what to do.

The scales are unphysical parameters,
and cannot be fit to data.

Or can they?

The scales dilemma

The behaviour of a cross section w.r.t. scale variations is not completely random.

For 'similar' conditions, one can expect a similar pattern

If we judge that such a 'similarity' holds, then we may, *perhaps*, transport the prediction of a specific scale choice with some confidence

$$\xi = \mu / \sqrt{m^2 + p_t^2}$$

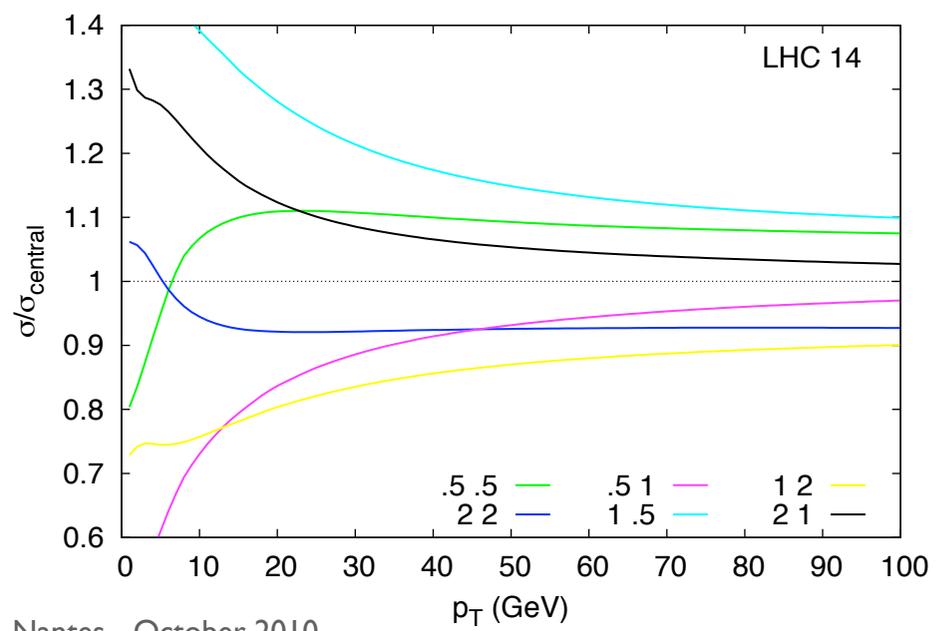
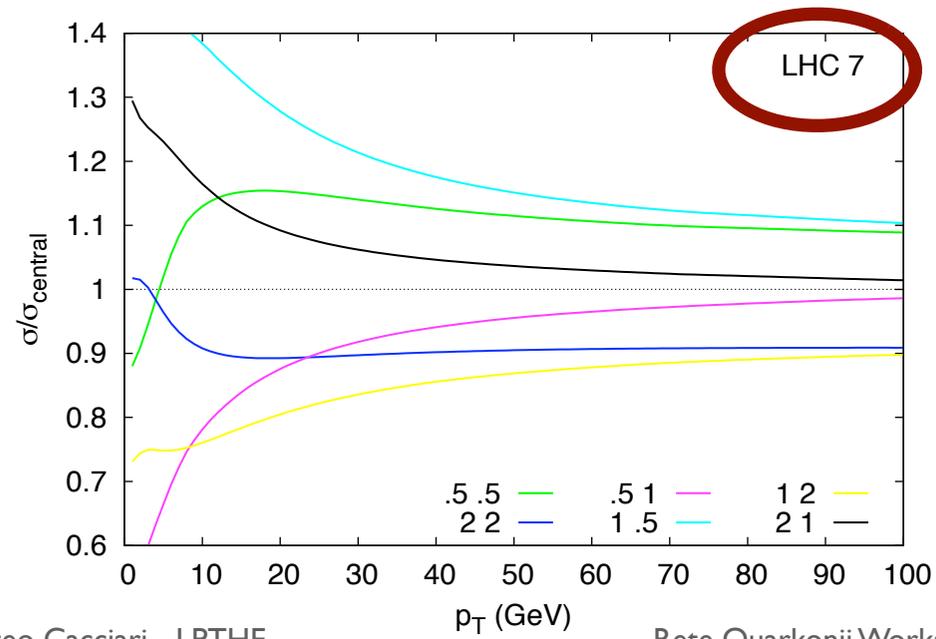
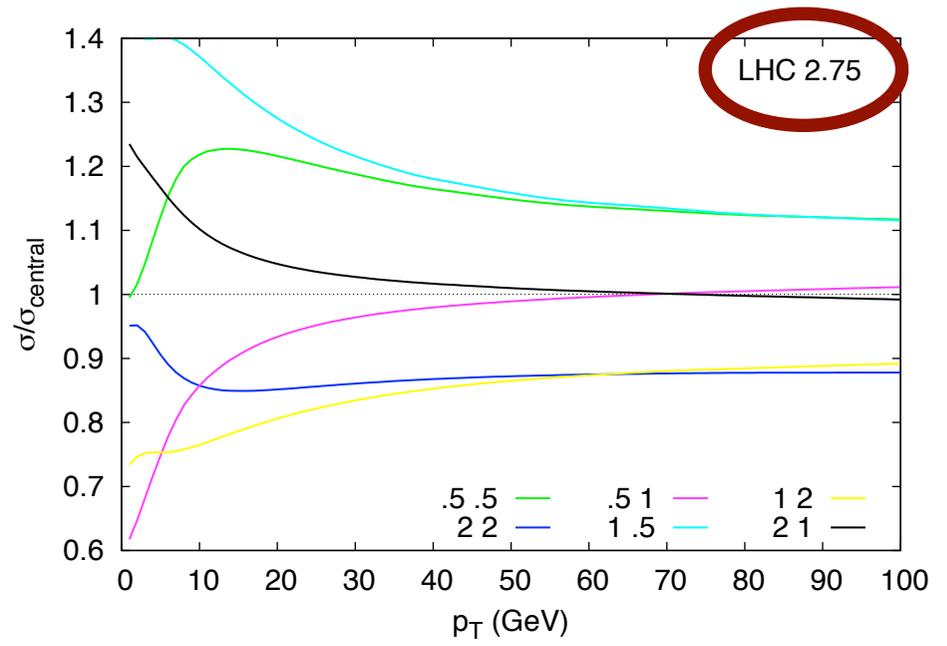
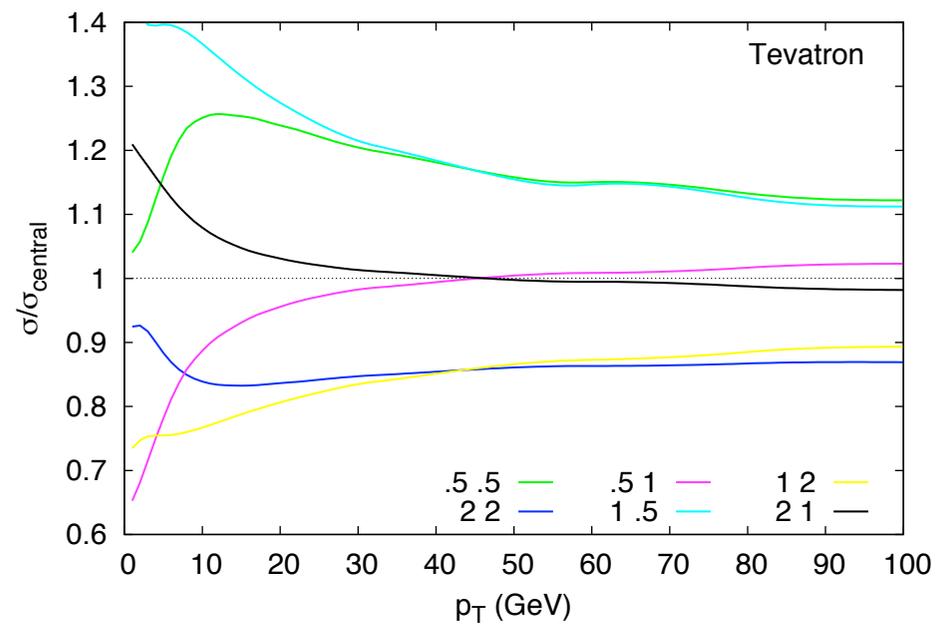
We study, as a function of p_t ,

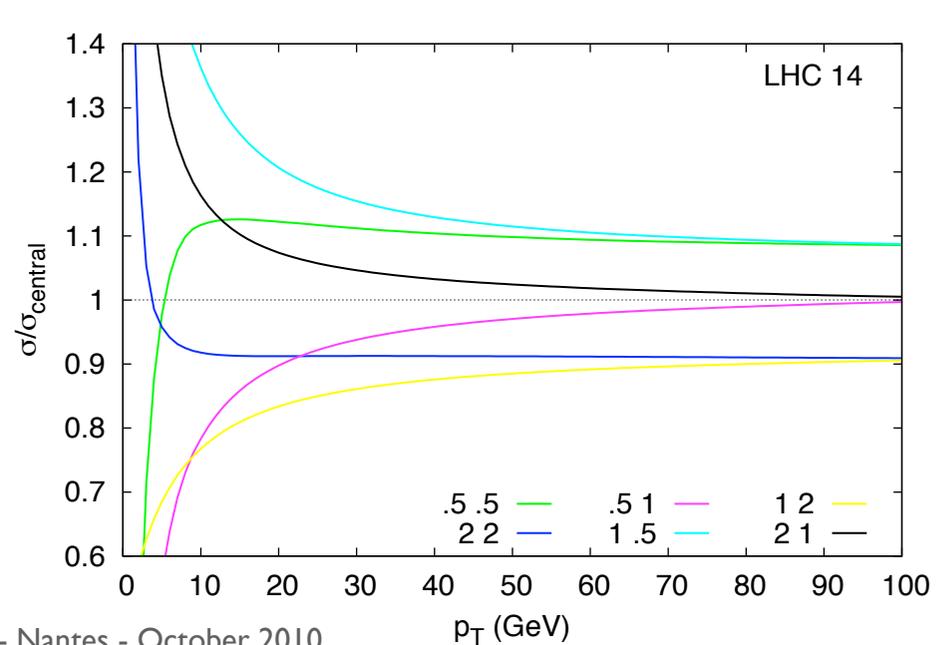
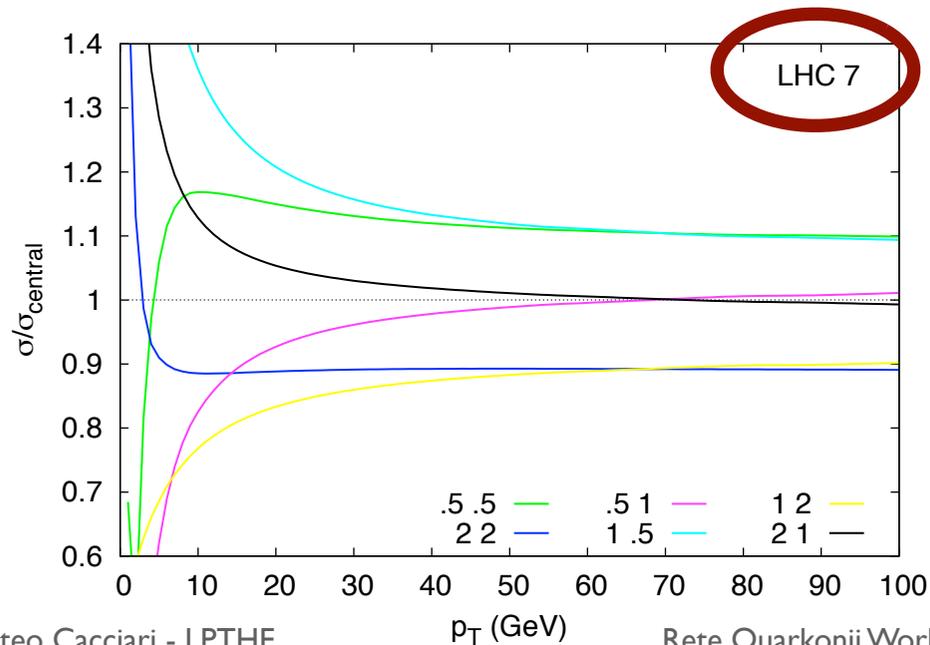
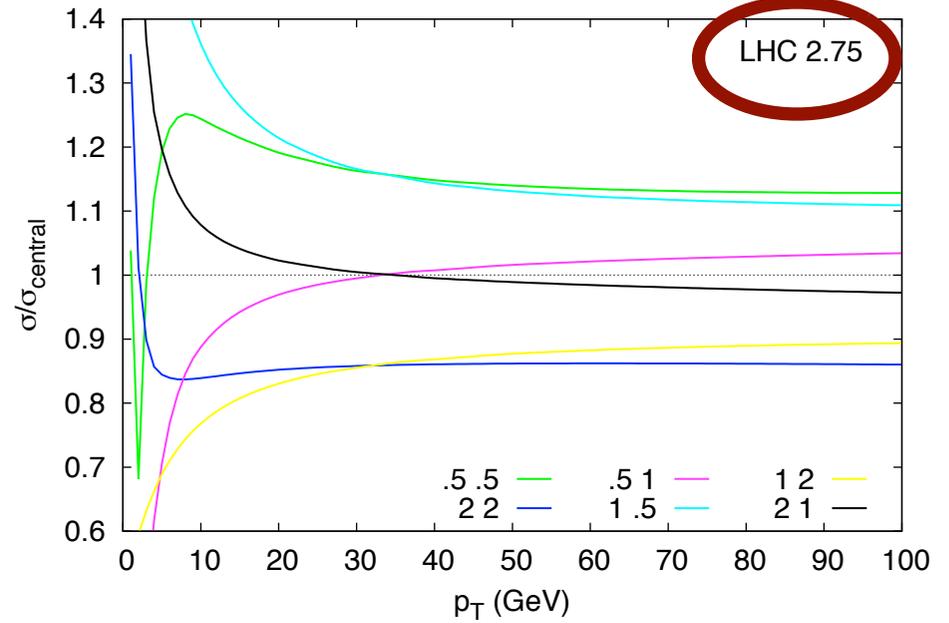
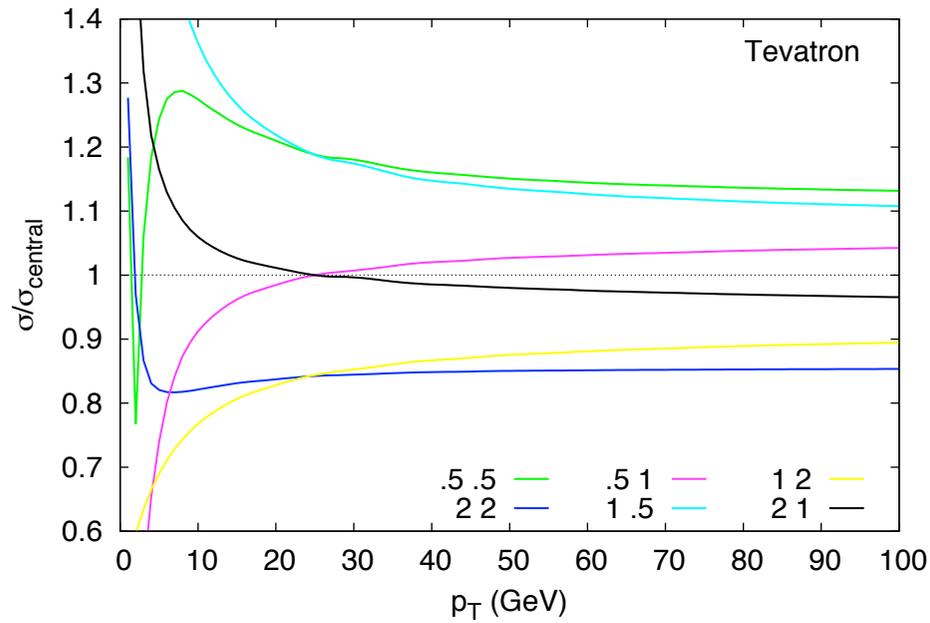
$$\frac{\frac{d\sigma(\xi_F, \xi_R)}{dp_t dy} \Big|_{y=0}}{\frac{d\sigma(\xi_F=1, \xi_R=1)}{dp_t dy} \Big|_{y=0}}$$



‘central’ choice

(though not necessarily the best)





Scale patterns

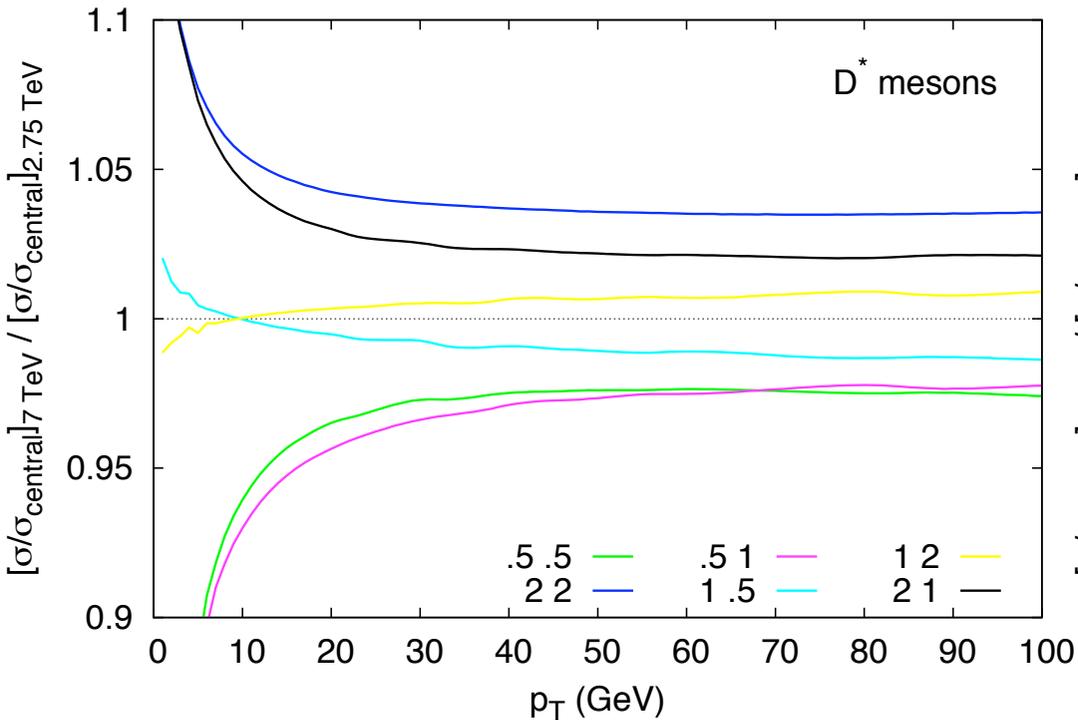
The patterns (as functions of p_t) looks fairly similar, especially for energies that are close

The 'true' cross section may very well not follow any of them.

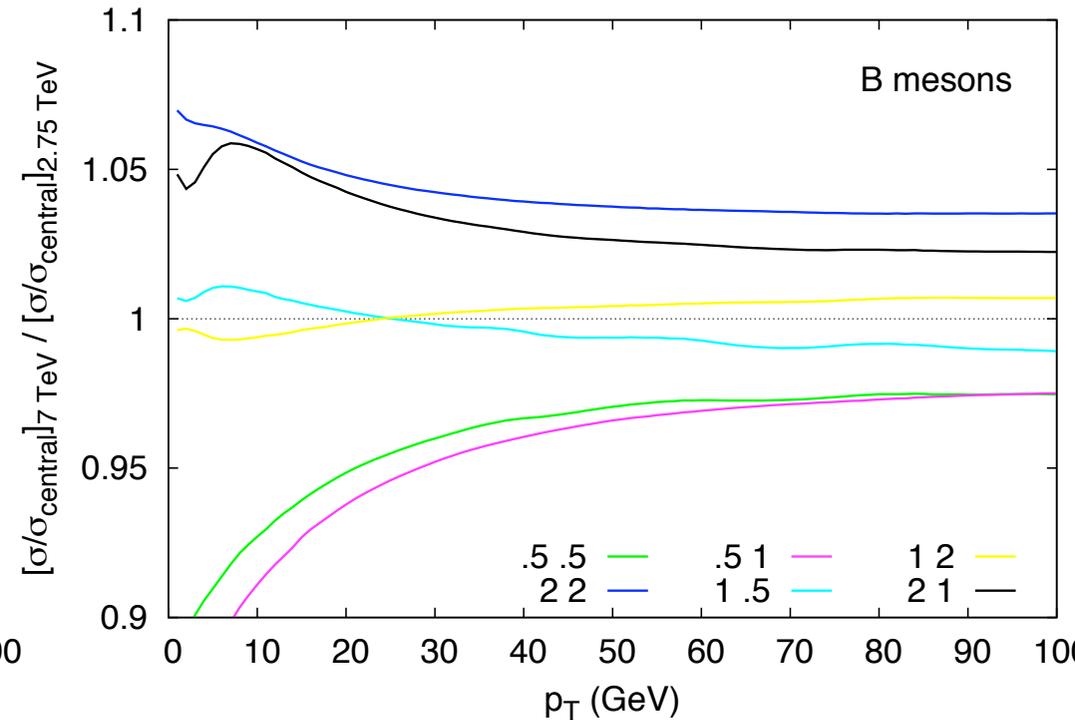
However, we may perhaps expect its behaviour not to vary wildly from one energy to another, if the scales behaviours are instead similar

Ratios of ratios

Charm



Bottom



Could these represent a reasonable estimate of the uncertainty of the interpolation?

(NB. I'm not saying. I'm just asking.
A more definite answer requires more thinking.)