Figure 2: Transverse momentum distribution of D^+ mesons at central rapidity, $|y| < 0.5$. Left plot: comparison among the central predictions of our four benchmark calculations, FONLL, MC@NLO, and POWHEG with PYTHIA or HERWIG showers. Right plot: theoretical systematics for the FONLL calculation, and the comparison with data from ALICE [51]. For the systematics we show the individual scale and PDF components, as well as the combined total (which includes mass variation, as described in the text).

3.2 Open bottom production from inclusive and fully-reconstructed $H_b \to D + X$ decays

The theoretical predictions for central production of B^+ mesons ($|y| < 0.5$) are presented in Fig. 4. The quality of the agreement among the various predictions is similar to the one seen in the D^+ case above. Other features, like – at large rapidity – the progressively larger theoretical uncertainty as a consequence of a larger PDF uncertainty, or the larger variance between the NLO+PS and the FONLL predictions (see Fig. 5), are also similar. The potential sensitivity of the Monte Carlo results to the specific tune used (though smaller than in the D-mesons case, see figure 1), should be kept in mind in this case too.

The first measurement of b-hadron production at the LHC was performed by the LHCb Collaboration [56]. The pseudorapidity distribution in the region $2 \leq \eta \leq 6$ was shown to be in good agreement with NLO and FONLL predictions (see Fig. 5 of [56]). The measured total cross section in this region was found to be (averaging over b and $\bar{b}$ hadrons)[5]

$$\sigma^{\mathrm{LHCb}}(pp \to H_b, 2 \leq \eta \leq 6) = 75.3 \pm 5.4 \pm 10.0 \ \mu b \tag{10}$$

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[5]Note that, as explained in [56], the measurement can change to $89.6 \pm 6.4 \pm 15.5 \ \mu b$ if b-hadron fractions measured at the Tevatron rather than those measured at LEP are used in converting the number of events to an H_b cross section.