

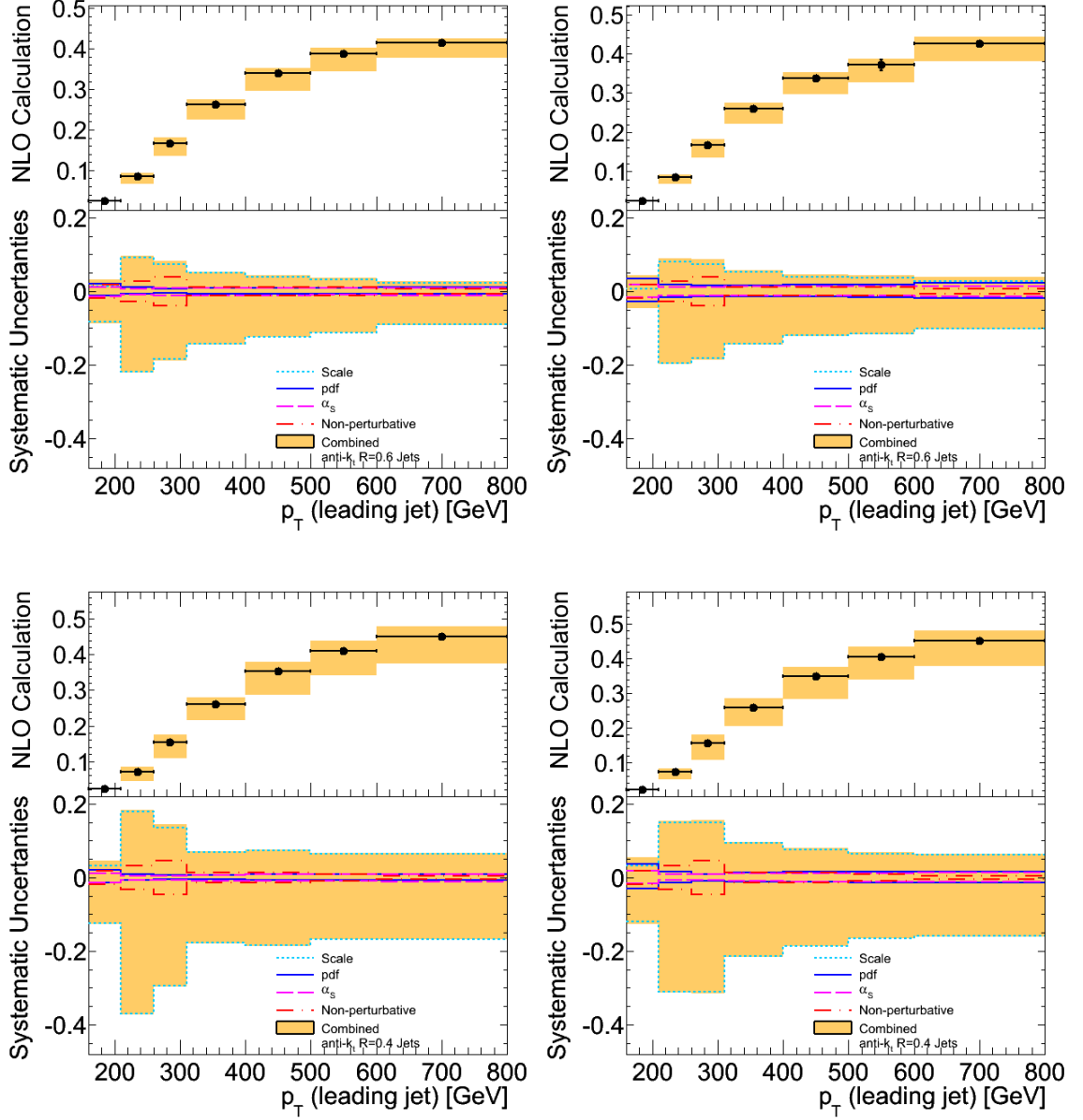


Figure E.9: NLO calculation of the three-to-two-jet cross-section ratio as a function of leading jet p_T for the third set of kinematic cuts studied and the estimated systematic uncertainty (band). Error bars on the predicted points corresponding to the statistical uncertainty in the calculation are small and not visible. The size of the three individual uncertainties that contribute to the total uncertainty is shown at the bottom. Results are shown for jets built using the anti- k_t algorithm with resolution parameter $R = 0.6$ (top) and $R = 0.4$ (bottom) and are obtained using the MSTW2008nlo (left) and CTEQ6.6 (right) pdf sets.

Appendix F

Additional Leading-Order and Next-to-Leading-Order Comparisons to the Data

This appendix presents additional comparisons to leading-order and next-to-leading-order calculations. Section F.1 presents additional comparisons of the data to the leading-order calculations presented in Table 9.1. The calculations shown in Chapter 10 are also shown for reference. The PYTHIA MC09 and MC09' calculations are not shown for clarity, but they follow closely the AMBT1 prediction. In addition, the results obtained with ALPGEN+HERWIG/JIMMY samples generated with different renormalization and factorization scales are shown as dotted lines above and below the ALPGEN+HERWIG/JIMMY AUET1 prediction in the left side figures. The renormalization and factorization scales are varied simultaneously by a factor of two up and down from the nominal value used in the ALPGEN samples to obtain these curves. While this does not constitute an uncertainty in the calculation, for reasons detailed in Chapter 10, it does give an idea of the intrinsic limitations in the leading-order calculation.

Section F.2 presents comparisons of kinematic observables in the two and three-jet bin in data and next-to-leading-order calculations. The calculations are not renormalized to the data, thus providing an idea of the accuracy of the next-to-leading-order predictions. The predictions for jets reconstructed with $R = 0.6$ are typically closer to the data than those for jets reconstructed with $R = 0.4$. Also, large uncertainties in the theoretical calculations arise near the kinematic thresholds for observables in the two-jet bin. These are caused by the samples generated with a lower renormalization scale, and point to a limitation in the

next-to-leading-order calculation and also the renormalization scale chosen, which would not be optimal for the study of these observables.

Finally, Section F.3 presents additional comparisons of measurements of the three-to-two-jet cross-section ratios to next-to-leading-order calculations, including comparisons to the calculations performed with the CTEQ6.6 pdf set and using jets reconstructed with $R = 0.4$. The conclusions drawn from these figures have already been discussed in Chapter 10.

F.1 Additional Comparisons to Leading-Order Monte Carlo Simulations

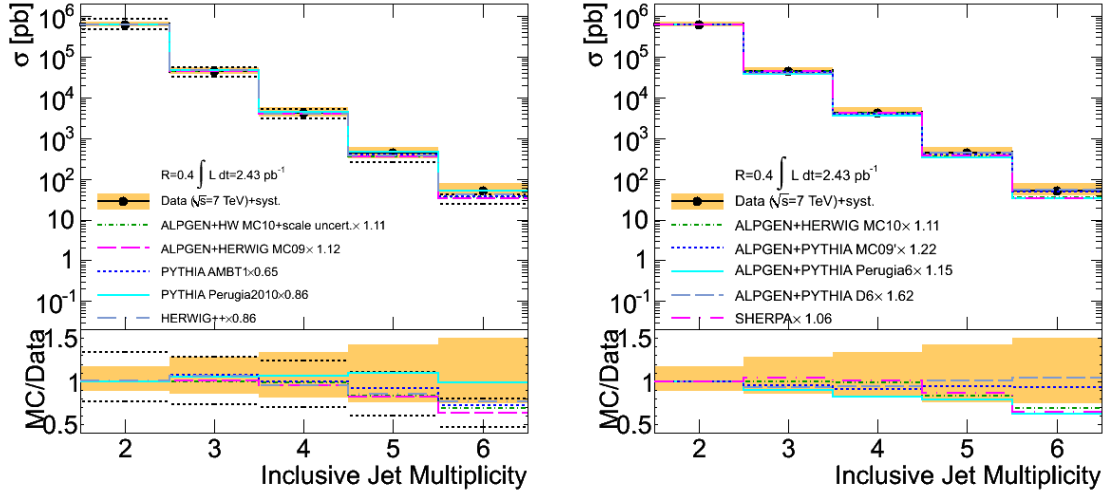


Figure F.1: Cross section as a function of inclusive jet multiplicity for jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$. The results are compared to additional leading-order Monte Carlo simulations normalized to the measured two-jet inclusive cross section. The error bands correspond to the systematic uncertainty in the measurement. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

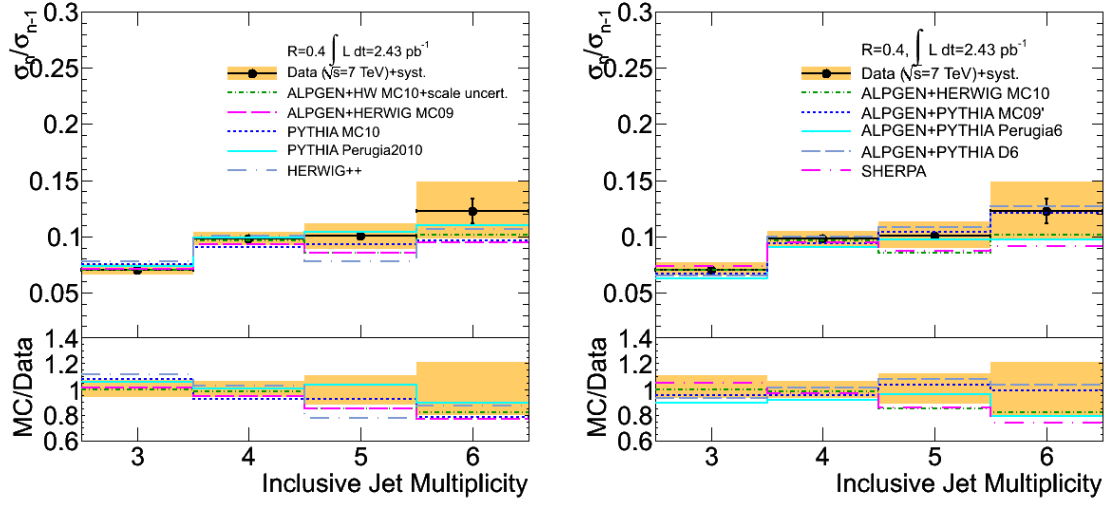


Figure F.2: Ratio of the n -jet cross section to the $(n-1)$ -jet cross section for values of n varying from three to six. The results are compared to additional leading-order Monte Carlo simulations for jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$. The error bands correspond to the systematic uncertainty in the measurement. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

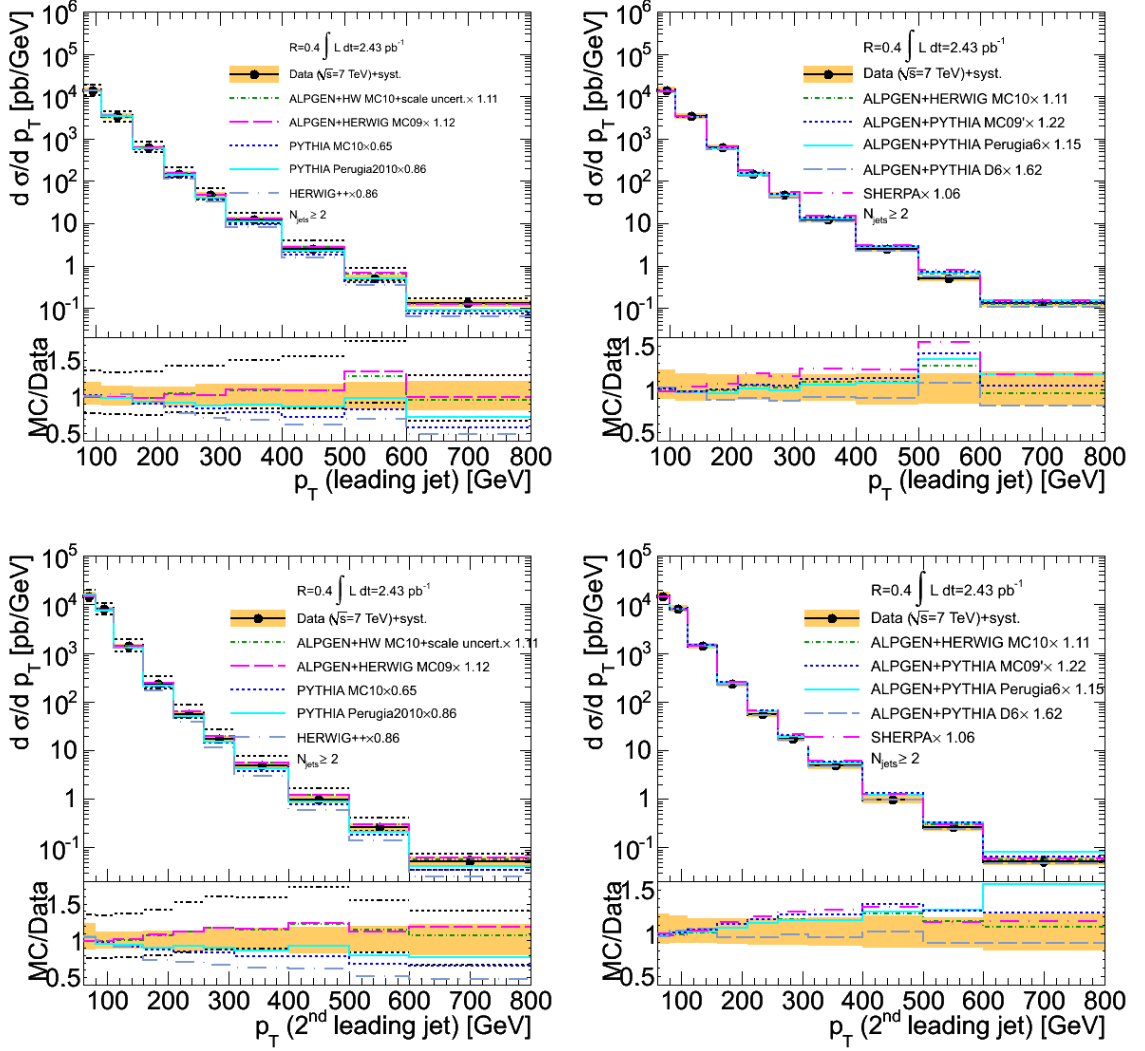


Figure F.3: Differential cross section as a function of leading jet p_T (top), and second leading jet p_T (bottom) for events with $N_{\text{jets}} \geq 2$. Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ are used in this study. The results are compared to additional leading-order Monte Carlo simulations normalized to the measured two-jet inclusive cross section. The error bands correspond to the systematic uncertainties in the measurements. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

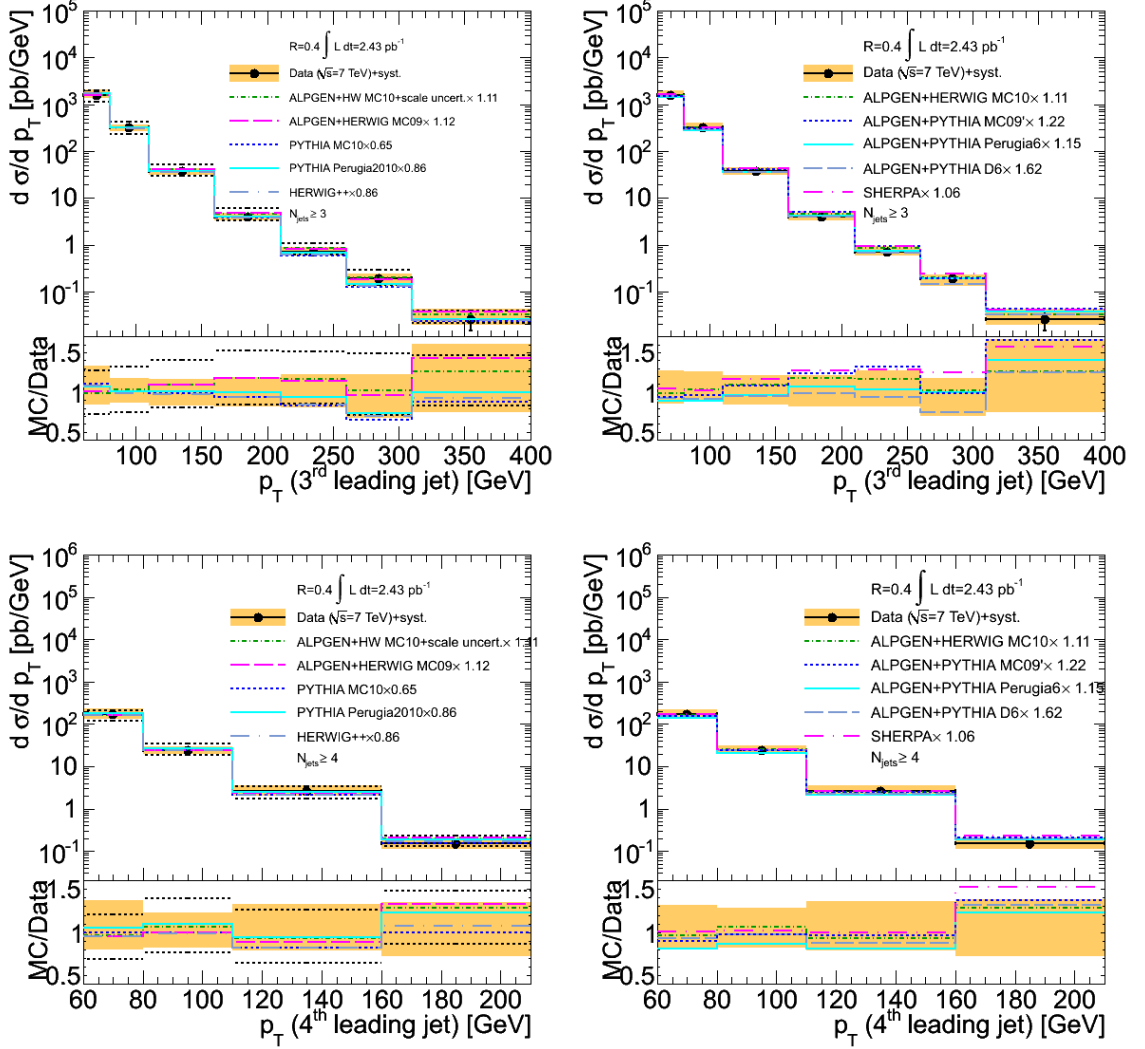


Figure F.4: Differential cross section as a function of third leading jet p_T for events with $N_{\text{jets}} \geq 3$ (top) and fourth leading jet p_T for events with $N_{\text{jets}} \geq 4$ (bottom). Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ are used in this study. The results are compared to additional leading-order Monte Carlo simulations normalized to the measured two-jet inclusive cross section. The error bands correspond to the systematic uncertainties in the measurements. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

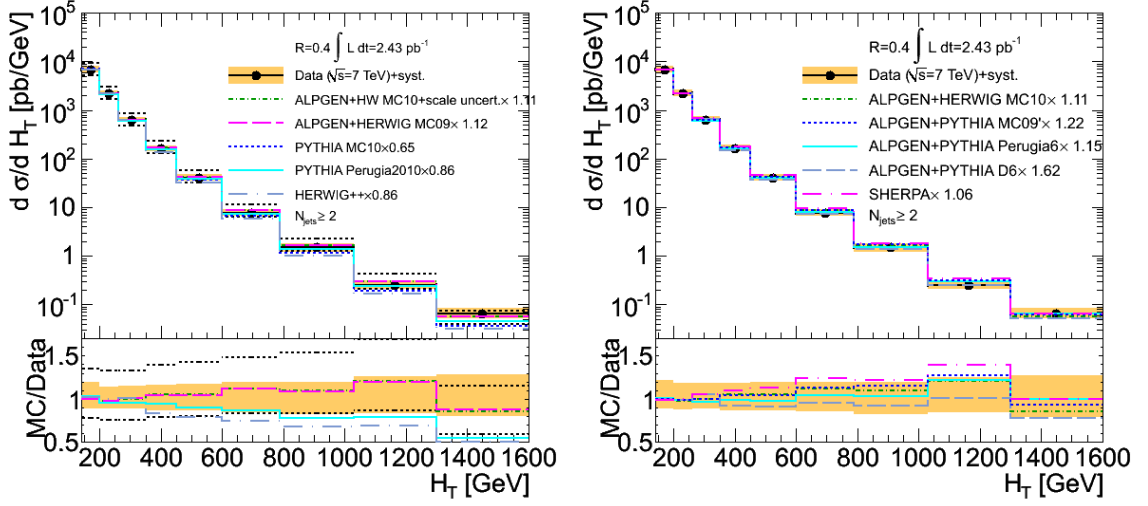


Figure F.5: Differential cross section as a function of H_T for events with at least two selected jets. Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ are used in this study. The results are compared to additional leading-order Monte Carlo simulations normalized to the measured two-jet inclusive cross section. The error bands correspond to the systematic uncertainties in the measurements. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

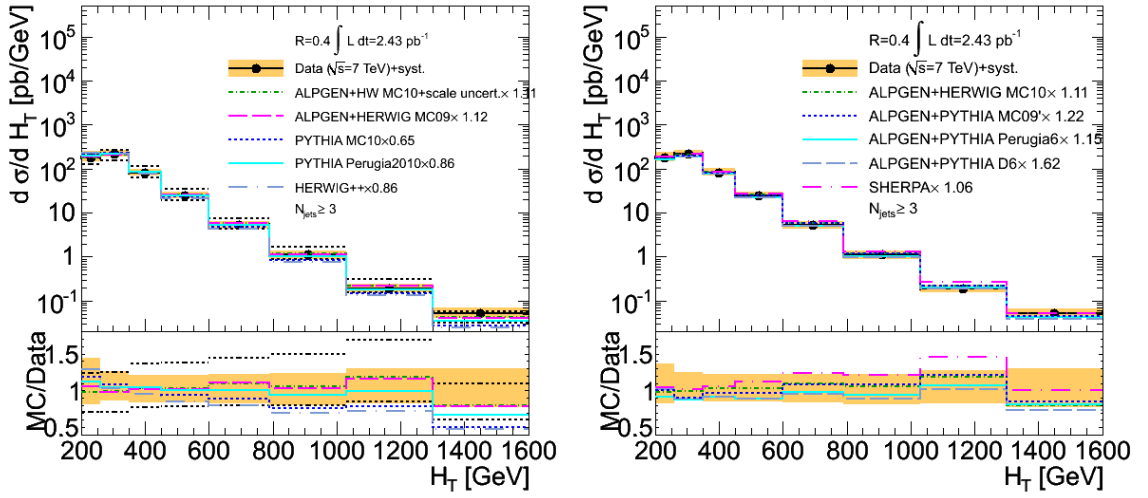


Figure F.6: Differential cross section as a function of H_T for events with at least three selected jets. Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ are used in this study. The results are compared to additional leading-order Monte Carlo simulations normalized to the measured two-jet inclusive cross section. The error bands correspond to the systematic uncertainties in the measurements. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

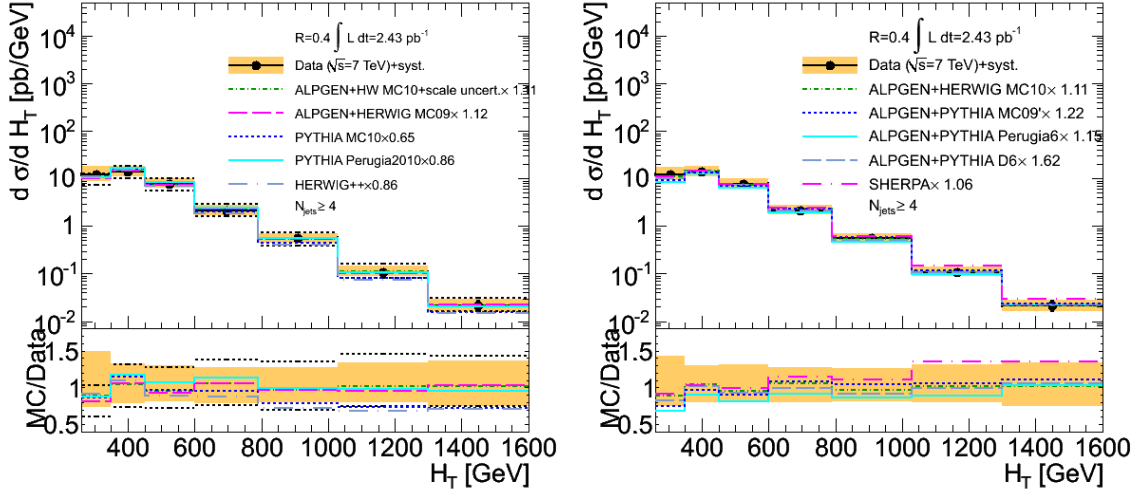


Figure F.7: Differential cross section as a function of H_T for events with at least four selected jets. Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ are used in this study. The results are compared to additional leading-order Monte Carlo simulations normalized to the measured two-jet inclusive cross section. The error bands correspond to the systematic uncertainties in the measurements. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

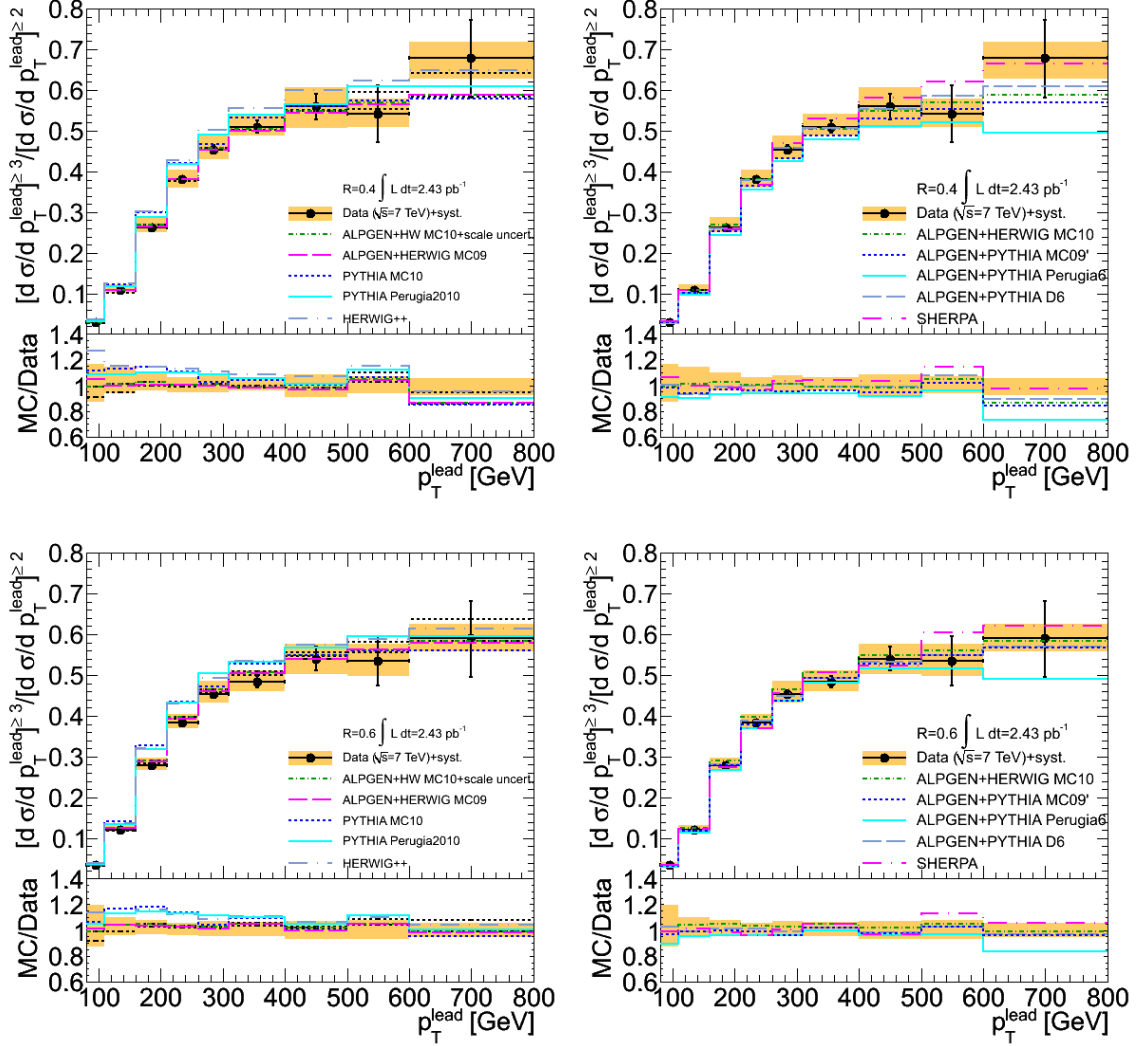


Figure F.8: Ratio of the three-jet to two-jet differential cross section as a function of the leading jet p_T using the default kinematic cuts on the jet selection. Jets built with the anti- k_t algorithm using a resolution parameter $R = 0.4$ (top) and $R = 0.6$ (bottom) are used in this study. The results are compared to additional leading-order Monte Carlo simulations. The error bands correspond to the systematic uncertainties in the measurements. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

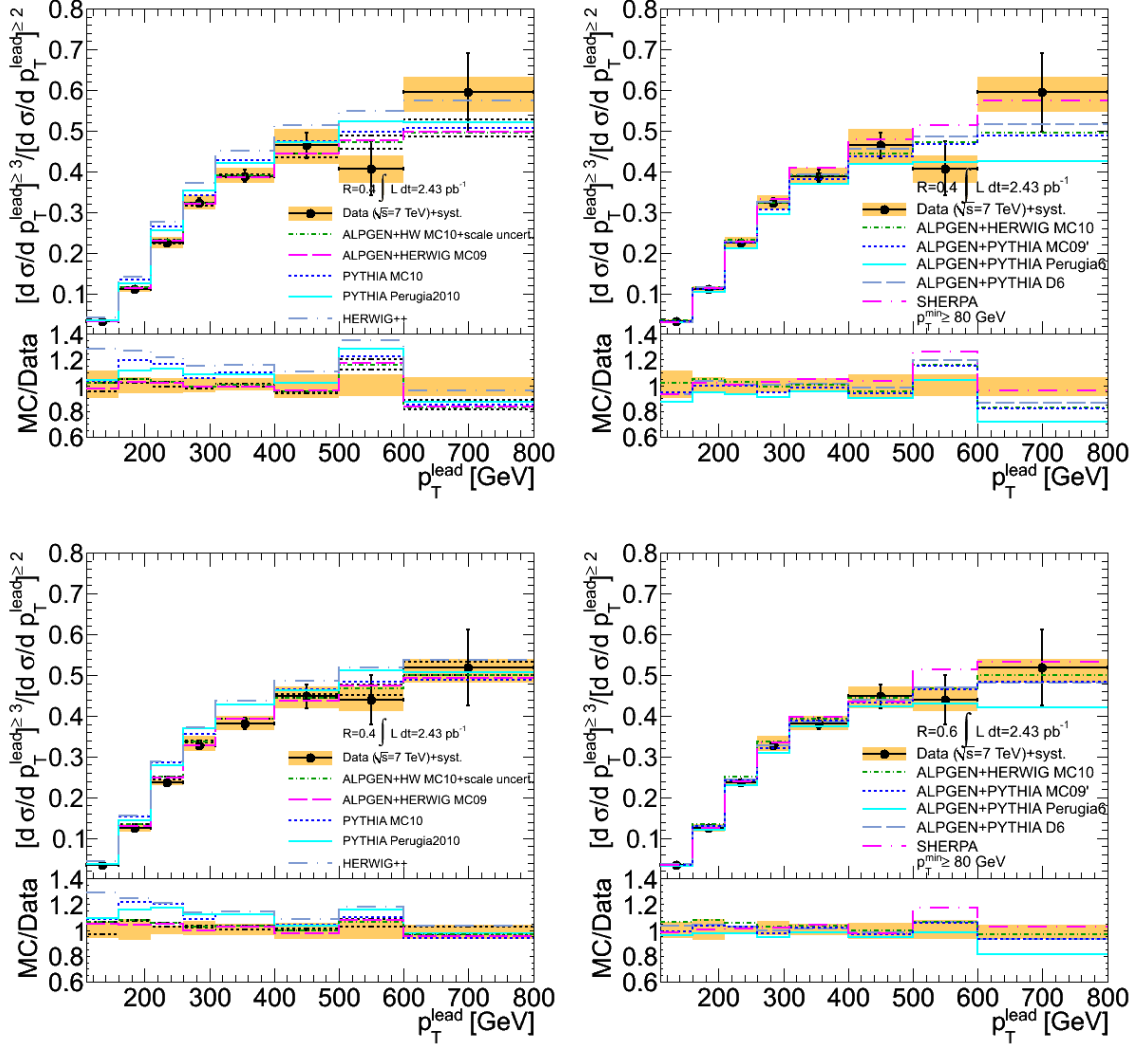


Figure F.9: Ratio of the three-jet to two-jet differential cross section as a function of the leading jet p_T using the second set of kinematic cuts on the jet selection. Jets built with the anti- k_t algorithm using a resolution parameter $R = 0.4$ (top) and $R = 0.6$ (bottom) are used in this study. The results are compared to additional leading-order Monte Carlo simulations. The error bands correspond to the systematic uncertainties in the measurements. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

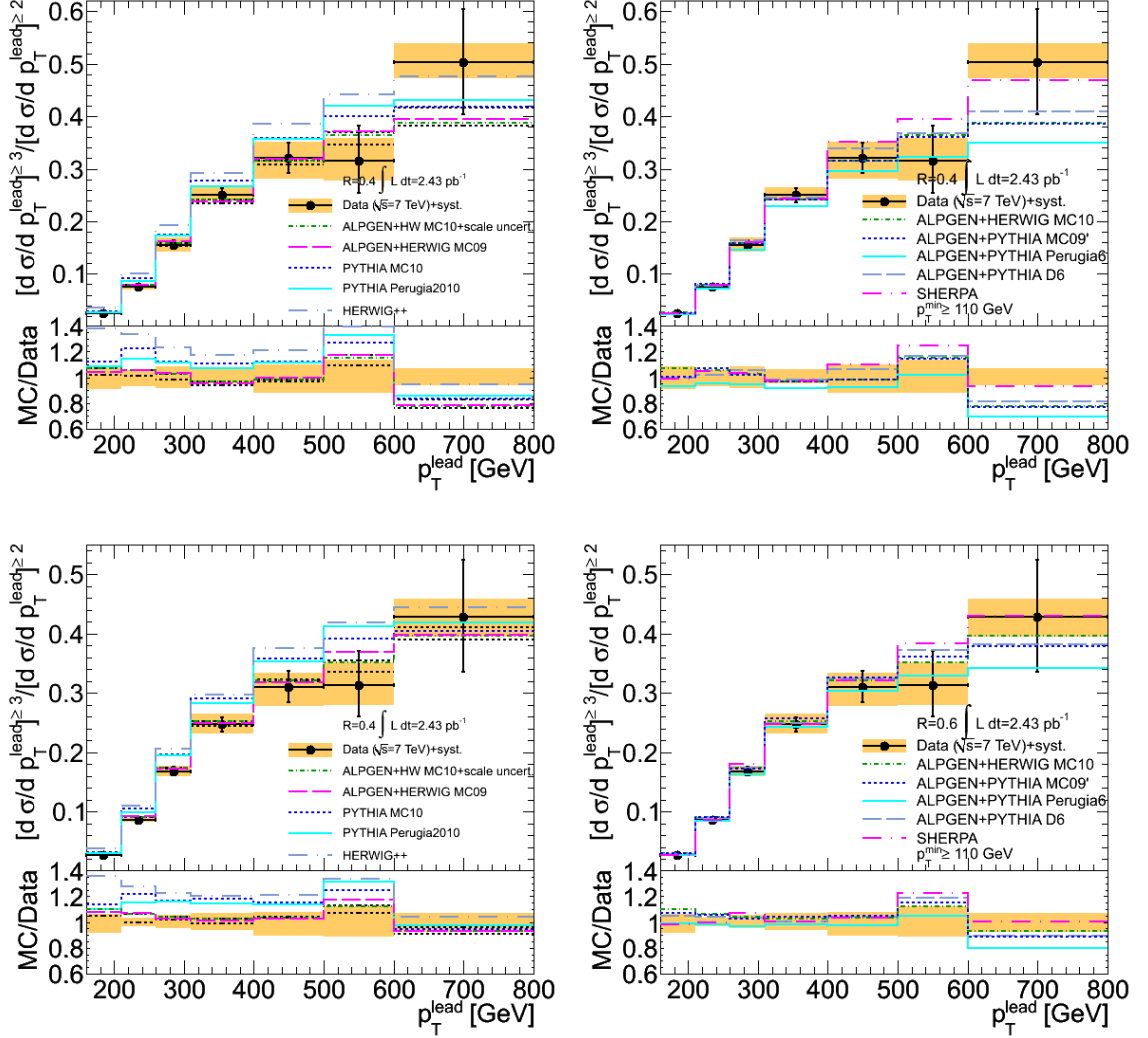


Figure F.10: Ratio of the three-jet to two-jet differential cross section as a function of the leading jet p_T using the third set of kinematic cuts on the jet selection. Jets built with the anti- k_t algorithm using a resolution parameter $R = 0.4$ (top) and $R = 0.6$ (bottom) are used in this study. The results are compared to additional leading-order Monte Carlo simulations. The error bands correspond to the systematic uncertainties in the measurements. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

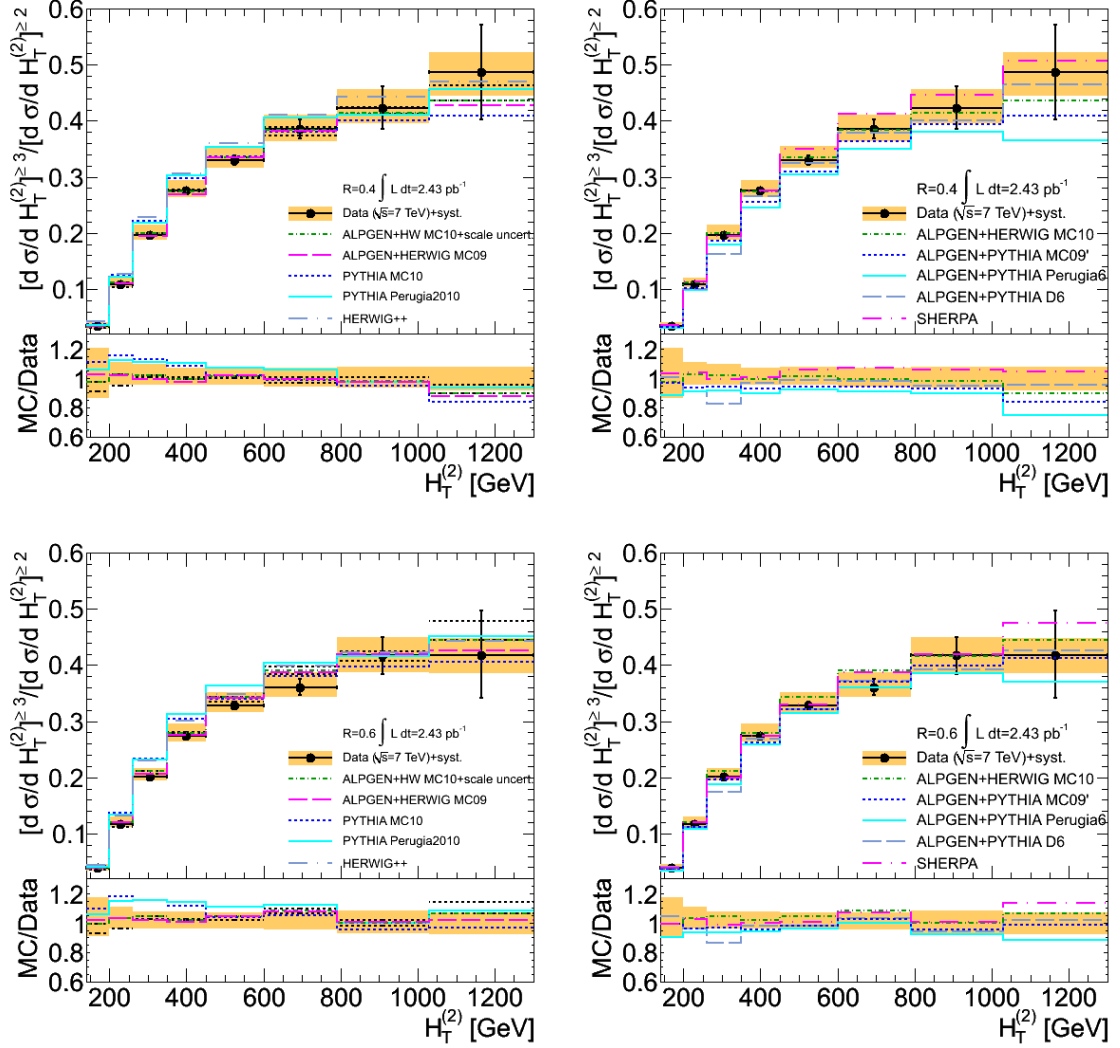


Figure F.11: Ratio of the three-jet to two-jet differential cross section as a function of the event $H_T^{(2)}$. Jets built with the anti- k_t algorithm using a resolution parameter $R = 0.4$ (top) and $R = 0.6$ (bottom) are used in this study. The results are compared to additional leading-order Monte Carlo simulations. The error bands correspond to the systematic uncertainties in the measurements. Plots of the ratios of the different Monte Carlo simulations to the data are presented at the bottom of each figure.

F.2 Comparisons of Kinematic Variables to Next-to-Leading-Order Calculations

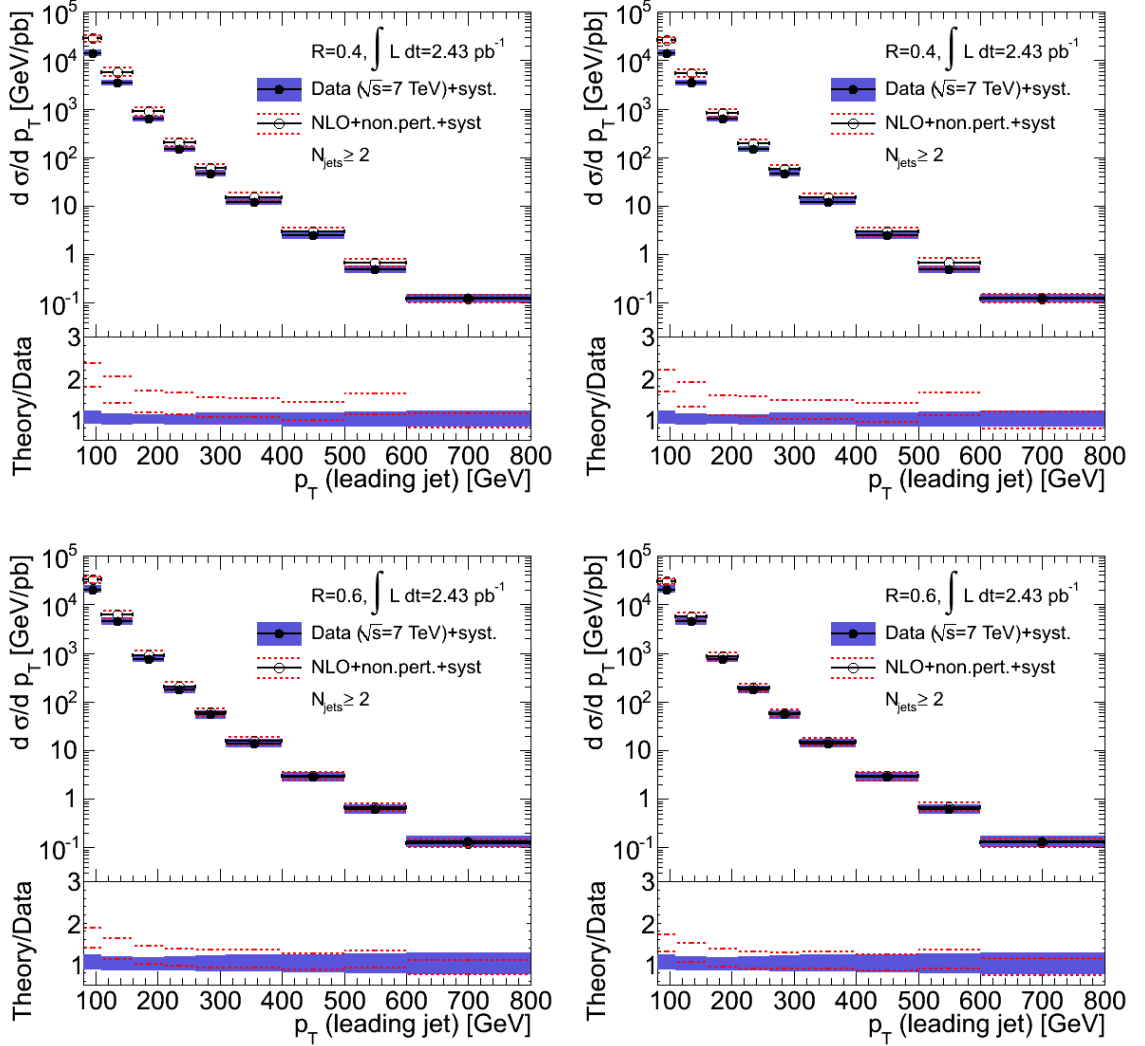


Figure F.12: Differential cross section as a function of leading jet p_T in two-jet events compared to a next-to-leading-order calculation. Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ (top) and $R = 0.6$ (bottom) are used in this study. The results are compared to a next-to-leading-order calculation performed with the MSTW2008nlo (left) and the CTEQ6.6 (right) pdf sets. The error bands correspond to the systematic uncertainties in the measurements. The systematic uncertainty in the next-to-leading-order calculation is shown as dotted lines above and below the calculation. Plots of the ratios of the theoretical calculations to the data are presented at the bottom of each figure.

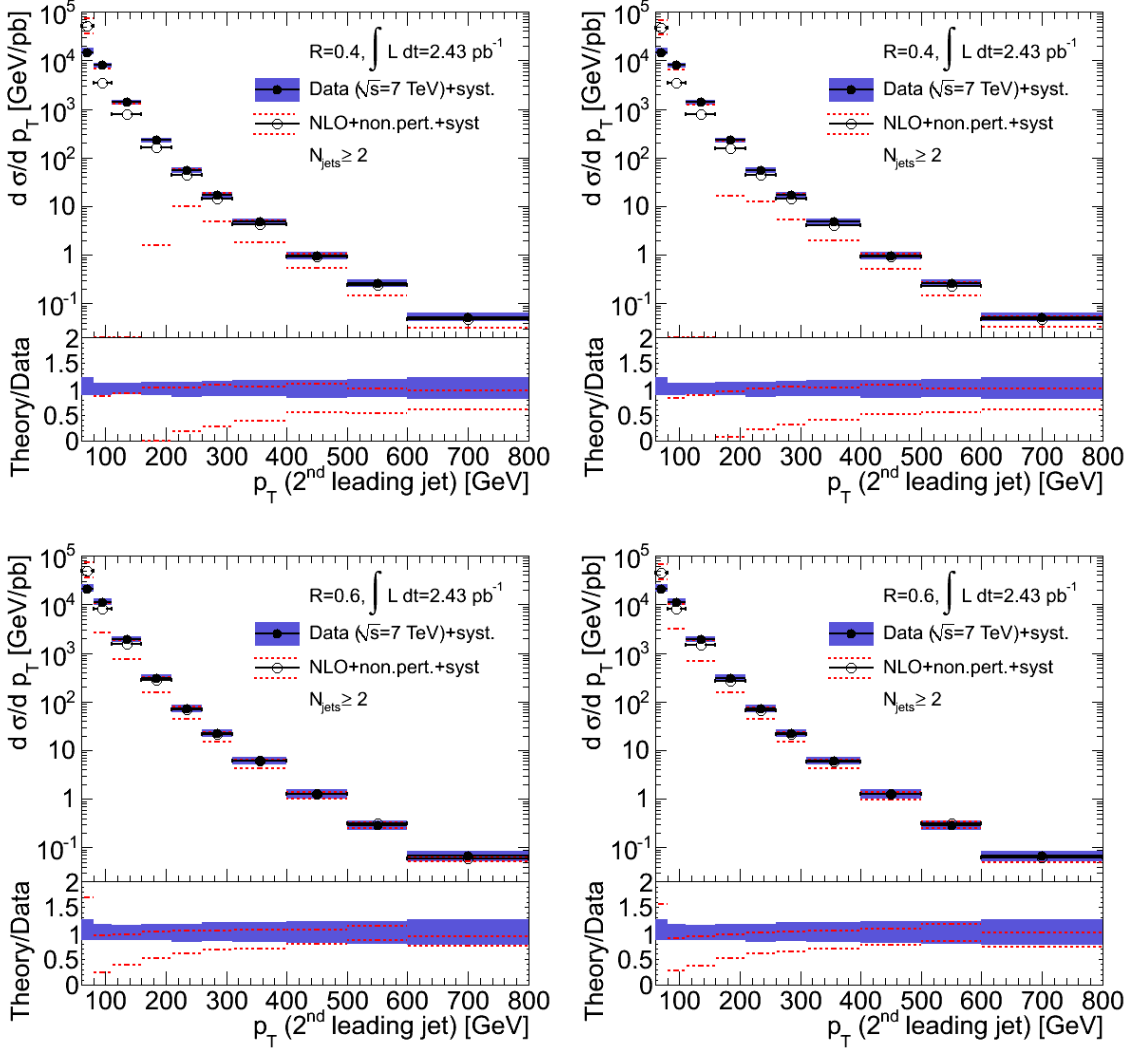


Figure F.13: Differential cross section as a function of second leading jet p_T in two-jet events compared to a next-to-leading-order calculation. Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ (top) and $R = 0.6$ (bottom) are used in this study. The results are compared to a next-to-leading-order calculation performed with the *MSTW2008nlo* (left) and the *CTEQ6.6* (right) pdf sets. The error bands correspond to the systematic uncertainties in the measurements. The systematic uncertainty in the next-to-leading-order calculation is shown as dotted lines above and below the calculation. Plots of the ratios of the theoretical calculations to the data are presented at the bottom of each figure.

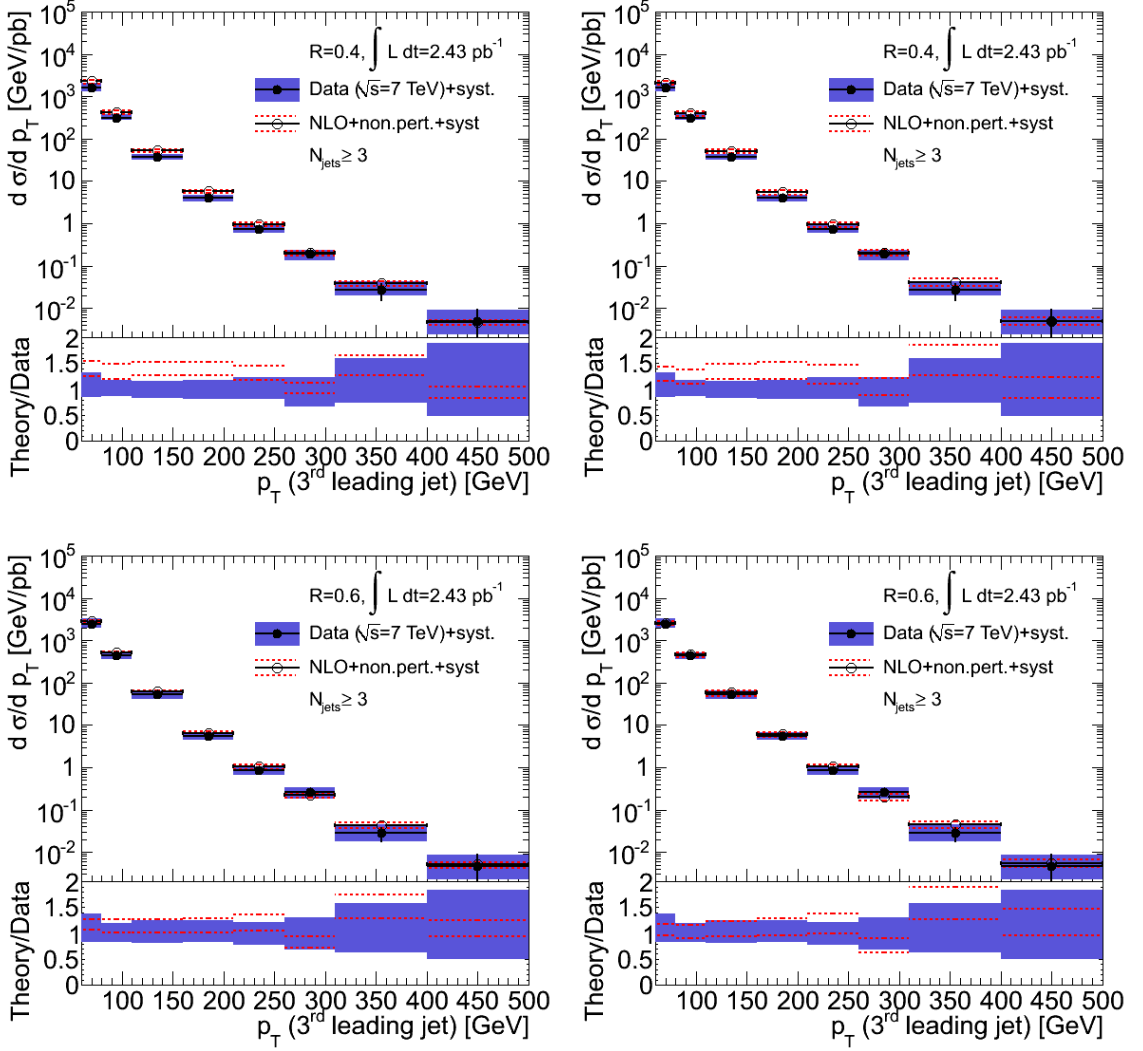


Figure F.14: Differential cross section as a function of third leading jet p_T in three-jet events compared to a next-to-leading-order calculation. Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ (top) and $R = 0.6$ (bottom) are used in this study. The results are compared to a next-to-leading-order calculation performed with the MSTW2008nlo (left) and the CTEQ6.6 (right) pdf sets. The error bands correspond to the systematic uncertainties in the measurements. The systematic uncertainty in the NLO calculation is shown as dotted lines above and below the calculation. Plots of the ratios of the theoretical calculations to the data are presented at the bottom of each figure.

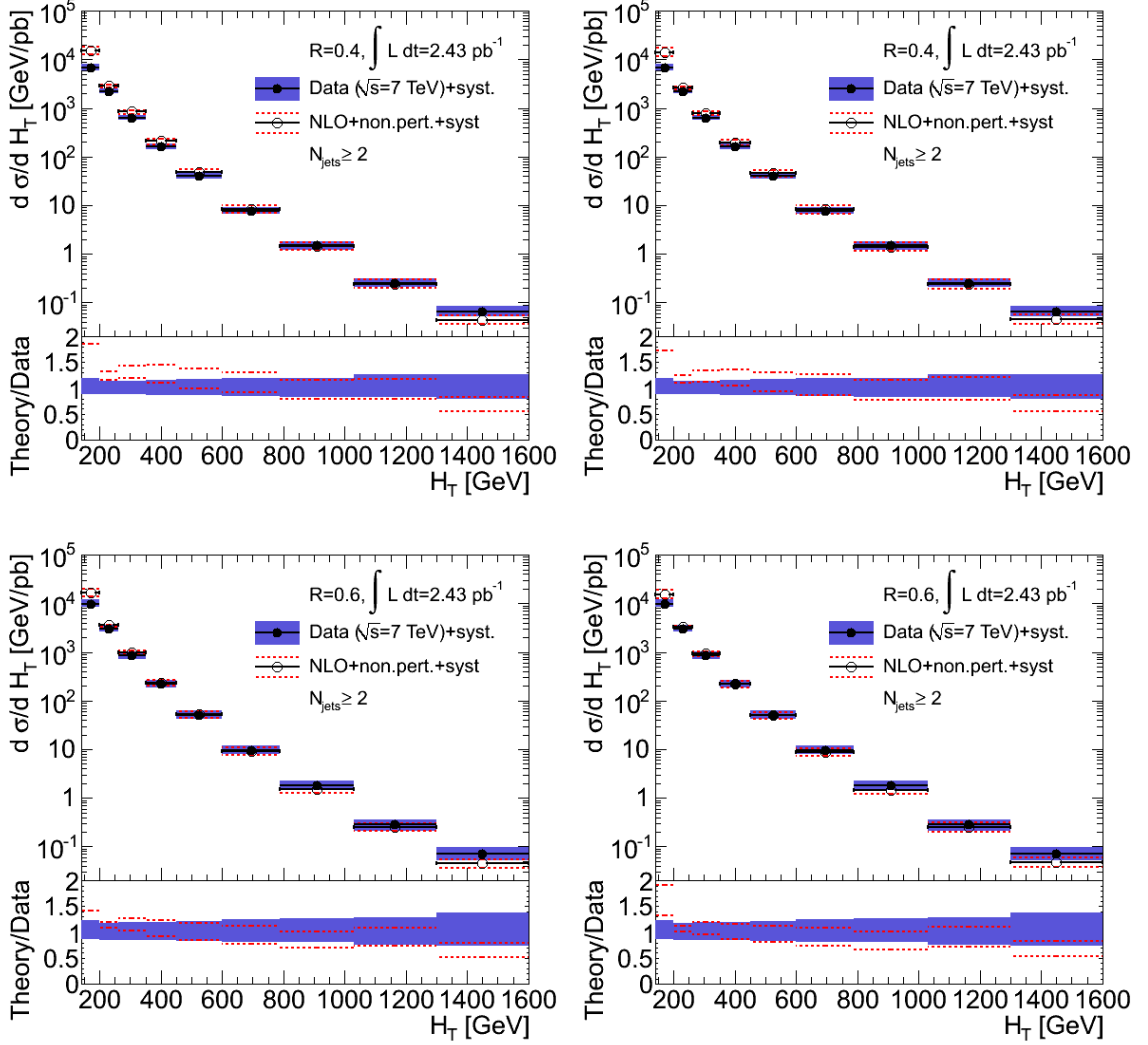


Figure F.15: Differential cross section as a function of event H_T in two-jet events compared to a next-to-leading-order calculation. Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ (top) and $R = 0.6$ (bottom) are used in this study. The results are compared to a next-to-leading-order calculation performed with the MSTW2008nlo (left) and the CTEQ6.6 (right) pdf sets. The error bands correspond to the systematic uncertainties in the measurements. The systematic uncertainty in the NLO calculation is shown as dotted lines above and below the calculation. Plots of the ratios of the theoretical calculations to the data are presented at the bottom of each figure.

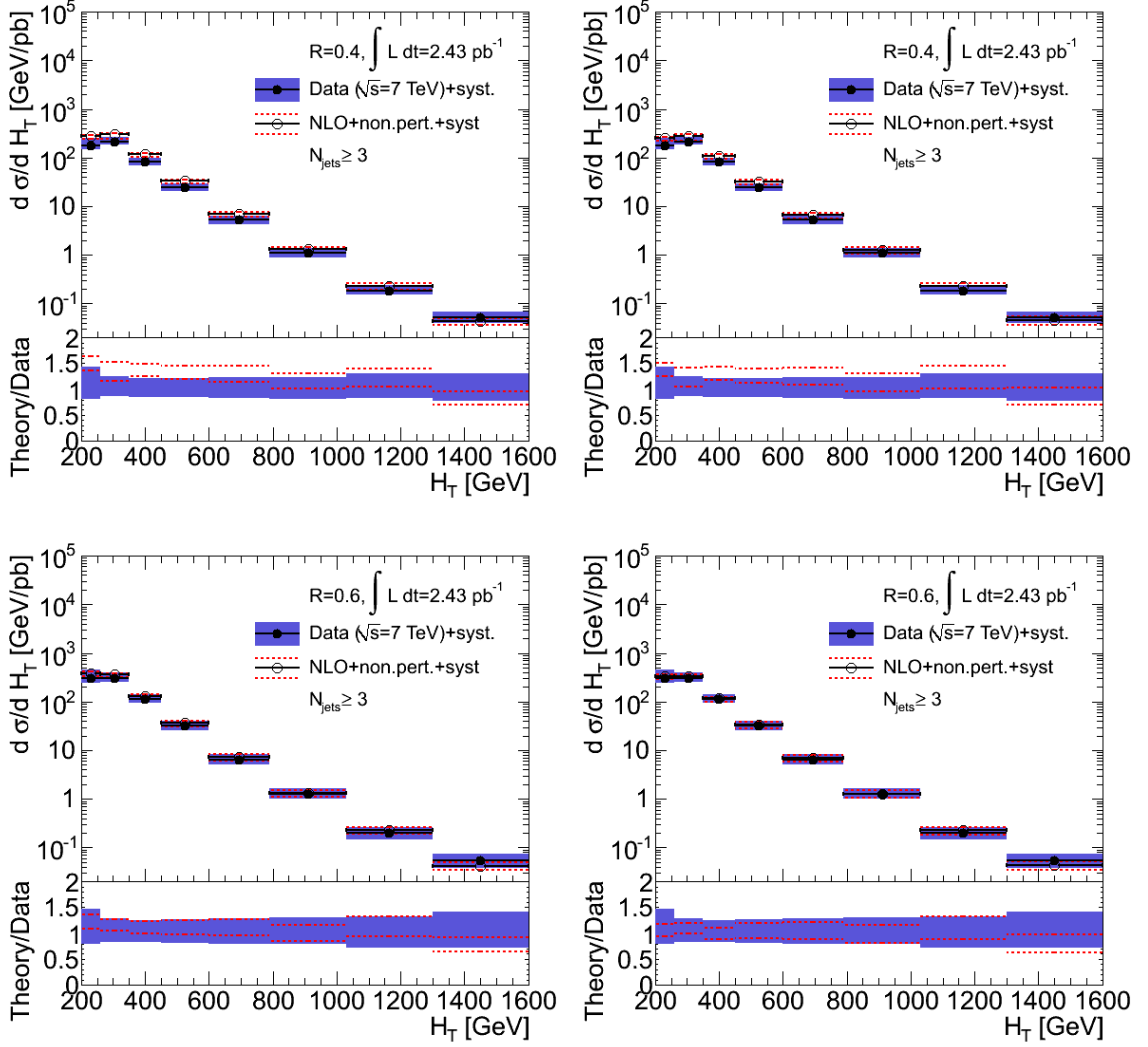


Figure F.16: Differential cross section as a function of event H_T in three-jet events compared to a next-to-leading-order calculation. Jets built using the anti- k_t algorithm with resolution parameter $R = 0.4$ (top) and $R = 0.6$ (bottom) are used in this study. The results are compared to a next-to-leading-order calculation performed with the MSTW2008nlo (left) and the CTEQ6.6 (right) pdf sets. The error bands correspond to the systematic uncertainties in the measurements. The systematic uncertainty in the next-to-leading-order calculation is shown as dotted lines above and below the calculation. Plots of the ratios of the theoretical calculations to the data are presented at the bottom of each figure.

F.3 Additional Comparisons of Ratios to Next-to-Leading-Order Calculations

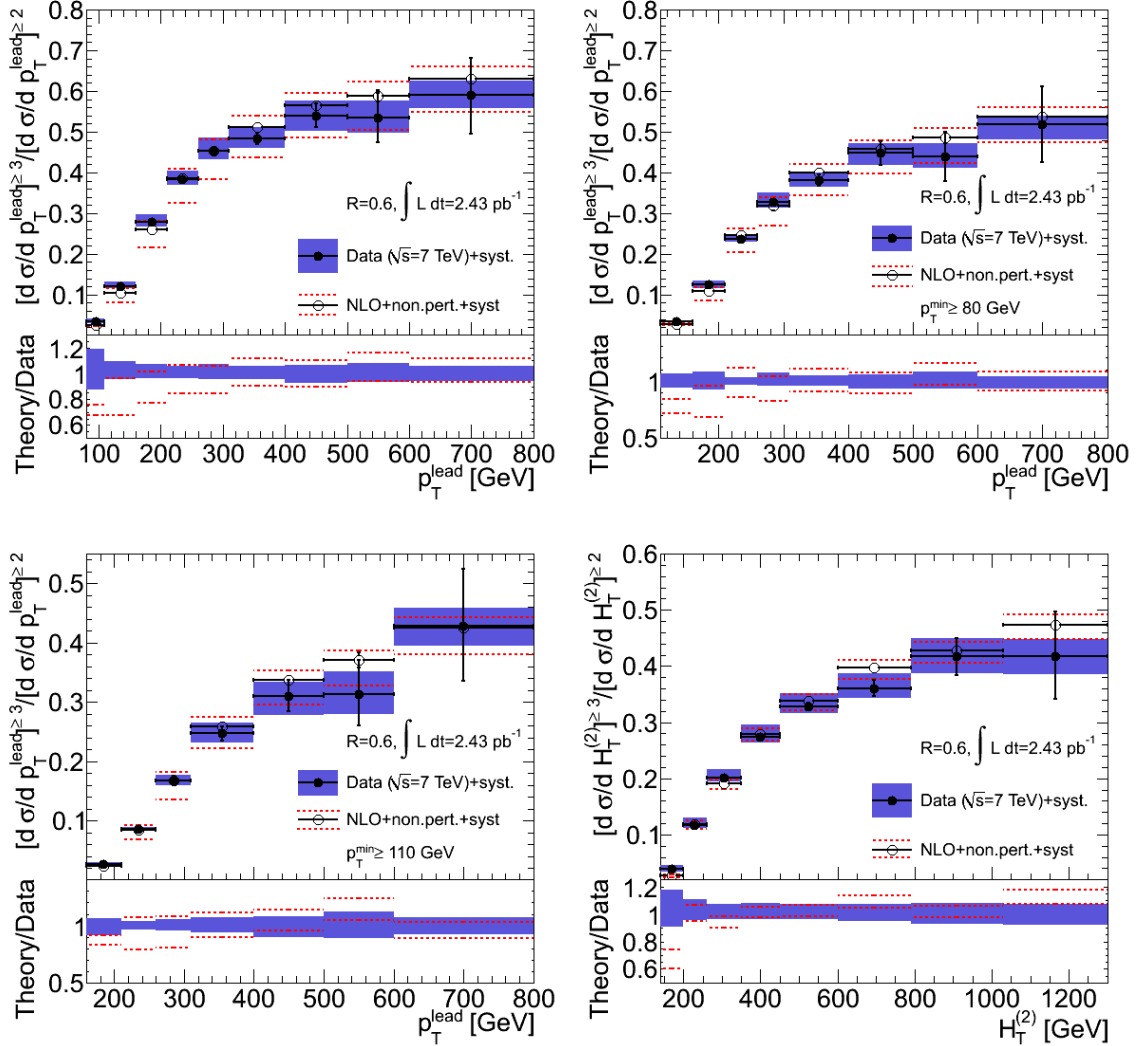


Figure F.17: Ratio of the three-jet to two-jet differential cross section as a function of the leading jet p_T (top, bottom left) using three different kinematic cuts on the jet selection and $H_T^{(2)}$ (bottom right). Jets built with the anti- k_t algorithm using a resolution parameter $R = 0.6$ are used in this study. The results are compared to a next-to-leading-order calculation performed with the CTEQ6.6 pdf set. The error bands correspond to the systematic uncertainties in the measurements. The systematic uncertainty in the next-to-leading-order calculation is shown as dotted lines above and below the calculation. Plots of the ratios of the theoretical calculation to the data are presented at the bottom of each figure.

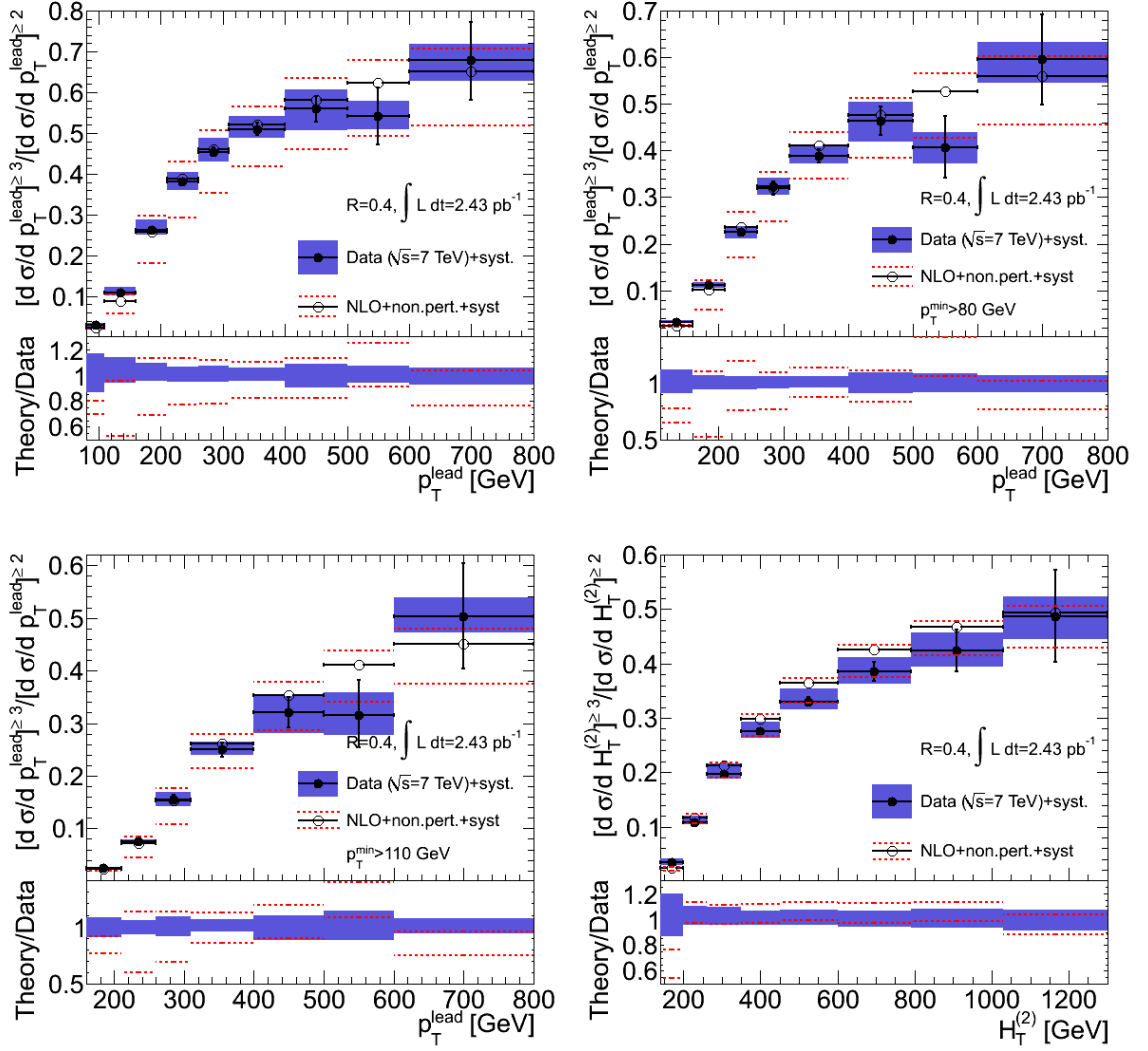


Figure F.18: Ratio of the three-jet to two-jet differential cross section as a function of the leading jet p_T (top, bottom left) using three different kinematic cuts on the jet selection and $H_T^{(2)}$ (bottom right). Jets built with the anti- k_t algorithm using a resolution parameter $R = 0.4$ are used in this study. The results are compared to a next-to-leading-order calculation performed with the *MSTW2008nlo* pdf set. The error bands correspond to the systematic uncertainties in the measurements. The systematic uncertainty in the next-to-leading-order calculation is shown as dotted lines above and below the calculation. Plots of the ratios of the theoretical calculation to the data are presented at the bottom of each figure.

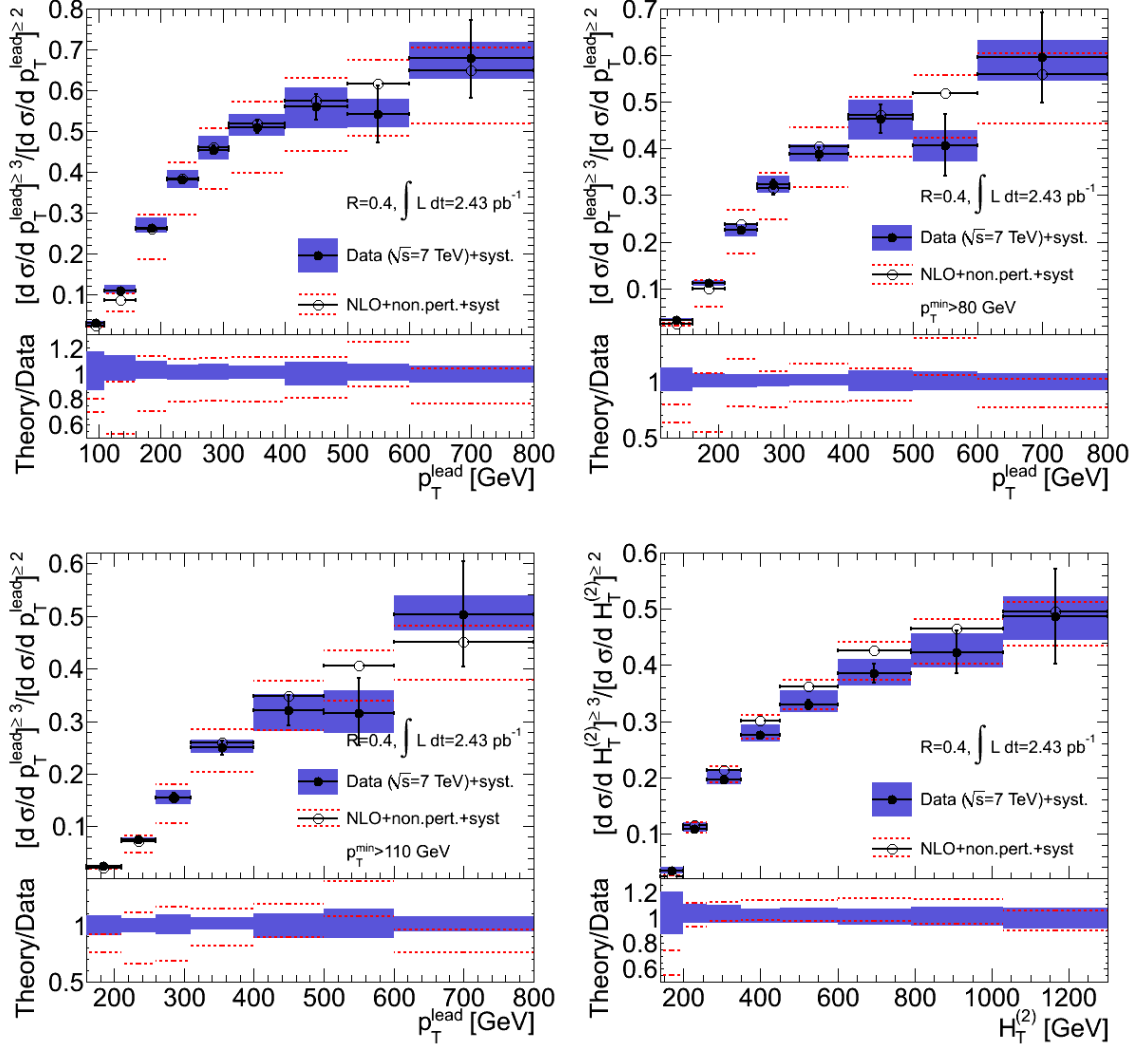


Figure F.19: Ratio of the three-jet to two-jet differential cross section as a function of the leading jet p_T (top, bottom left) using three different kinematic cuts on the jet selection and $H_T^{(2)}$ (bottom right). Jets built with the anti- k_t algorithm using a resolution parameter $R = 0.4$ are used in this study. The results are compared to a next-to-leading-order calculation performed with the CTEQ6.6 pdf set. The error bands correspond to the systematic uncertainties in the measurements. The systematic uncertainty in the next-to-leading-order calculation is shown as dotted lines above and below the calculation. Plots of the ratios of the theoretical calculation to the data are presented at the bottom of each figure.

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