General procedure for CKKW-L merging

- From the ME input (Les Houches Event Files), find all possible shower histories
- Pick one history according to the probability with which the shower would have produced it.
- Generate the Sudakov factor by trial showering. Reweight with $\alpha_s$ factors and PDF factors.
- Combine histograms for all ME multiplicities to get distributions for ME+PS merging.
Multiple interactions

This is the first time CKKW-L is implemented outside Ariadne. Also included is a treatment of interleaved multiple interactions. Example: $W + 3$ jets in the shower can come from

- (a) Three emissions at any scale
- (b) One emission at any scale, followed by one multiple interaction at a lower scale
- (c) One multiple interaction at any scale, followed by one emission at a lower scale

If we want to correct (b), we should include a no-emission probability for multiple interactions in the reweighting of the $W + 1$ jet sample.
Status of CKKW-L merging in Pythia8

$pp \rightarrow V + \text{jets (LO)}$ and $e^+e^- \rightarrow \text{jets (LO)}$ are implemented and working.

Figure: *Left panel:* $d_1$ separation in the $k_t$ algorithm for 1 jet merging at Tevatron energies. *Right panel:* Same for 3 jet merging.
Figure: Left panel: $d_2$ separation in the $k_t$ algorithm for 3 jet merging at Tevatron energies.
Right panel: $d_3$ separation in the $k_t$ algorithm for 3 jet merging at Tevatron energies.
**W + jets plots II**

**Figure:** *Left panel:* $R$ separation between the hardest ($p_\perp > 40$ GeV) and second hardest jet for 3 jet merging at Tevatron energies (all jets with $p_\perp > 12$ GeV).

*Right panel:* Rapidity between the system of the two hardest jets and the $W$ for 3 jet merging at Tevatron energies.