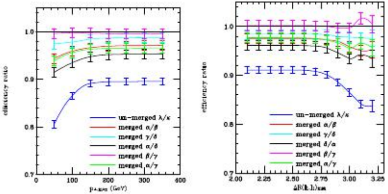

Figure 10. The variation of the ratio of efficiencies with different values of the cuts $p_{\perp,\max}$ (left) and $\Delta R_{\min}(h,h)$ (right) between two different samples for merged and un-merged samples. The sample parameters are: un-merged: κ: $\mu = m_h$, λ: $\mu = 2m_h$. merged with $\epsilon_{clus} = 30$ GeV: α: $(\mu = m_h + p_\perp^{hh}$, $E_{Tclus} = 50$ GeV), β: $(\mu = 2(m_h + p_\perp^{hh})$, $E_{Tclus} = 50$ GeV), γ: $(\mu = m_h + p_\perp^{hh}$, $E_{Tclus} = 70$ GeV), δ: $(\mu = 2(m_h + p_\perp^{hh})$, $E_{Tclus} = 70$ GeV), all with $\epsilon_{clus} = 30$ GeV.

Process	κ	λ	α	β	$t\bar{t}$	$S/B(\kappa)$	$S/B(\lambda)$	$S/B(\alpha)$	$S/B(\beta)$
σ [fb]	40.20	40.20	40.20	40.20	9×10^5	.00004	.00004	.00004	.00004
BRs	2.97	2.97	2.97	2.97	11000	.00027	.00027	.00027	.00027
τ cuts	0.78	0.82	0.79	0.80	296.4	.00263	.00277	.00266	.00270
fat jet cuts	0.106	0.104	0.11	0.11	0.93	0.11	0.11	0.12	0.12
$\Delta R(h,h)$	0.106	0.100	0.099	0.101	0.310	0.34	0.32	0.32	0.33
$p_\perp^{hh}$	0.103	0.089	0.095	0.093	0.207	0.50	0.43	0.46	0.45

Table 2. Cross sections for the hh signal and $t\bar{t}$ aMC@NLO background after series of cuts. The un-merged samples κ and λ have $\mu = m_h$ and $\mu = 2m_h$ respectively and the merged signal samples 'α' and 'β' have $\mu = m_h + p_\perp^{hh}$ and $\mu = 2(m_h + p_\perp^{hh})$ respectively, as well as $E_{Tclus} = 50$ GeV and $\epsilon_{clus} = 30$ GeV. The final two cuts were chosen to be $\Delta R(h,h) > 2.8$ and $p_\perp^{hh} < 80$ GeV.

certainties in the predictions of the efficiencies of experimental cuts. The uncertainty will inexorably propagate to measurements of the Higgs boson self-coupling. The merged samples demonstrate theoretical uncertainties on the efficiencies that are 10% or better for the examined observables. We expect such conclusions to remain valid for a future NLO simulation matched to the parton shower. We thus recommend the use of samples that include the merged exact one-jet matrix elements in all future phenomenological or experimental analyses of the process. The Monte Carlo event generator developed for this project is available as an add-on to the HERWIG++ event generator at http://www.itp.uzh.ch/~andreasp/hh.