Top quark production at hadron colliders
Phaf, L.K.

Citation for published version (APA):
Phaf, L. K. (2004). Top quark production at hadron colliders

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: http://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
Appendix C

Additional backgrounds

In this appendix we will discuss the $W$+jets background where the $W$ decays to a tau and we will show that all background contributions coming from $Z$+jets events can be neglected.

C.1 $W \rightarrow \tau \nu$ background

The relative size of this background contribution is estimated from a $W$+jets Monte Carlo sample. If the $W$ is allowed to decay only to an electron, 4.7% of the events pass all cuts up to (but excluding) the topological cuts. If the $W$ can only decay to a tau, only 0.5% of the events survive these cuts. This is so much lower, because less than one fifth of the taus decays to an electron, and these electrons have lower energy than in a direct decay.

In the analysis, the $W$+jets contribution is a combination of the $W$ events where the $W$ decays directly to an electron and events where the $W$ decays first to a tau. The cascade decays make up about 10% of the events. As the jets in these events come only from initial state QCD interactions, we expect the jet multiplicity spectra to be the same for both contributions. We can therefore treat them together as one $W$+jets background in the Berends scaling fit. As the efficiency for the topological cuts for the cascade events (18 ± 7%) is consistent with the one found in events where the $W$ decays directly to an electron, it is correct to treat both $W$ backgrounds together for the topological cuts, as we do in the analysis.

C.2 $Z$+jets backgrounds

The $Z$+jets events can mimic the correct event signature in two ways:
- The $Z$ decays to electrons, and one of the electrons is either missed, or not identified as an electron.

- The $Z$ decays to taus, where one tau decays to an electron (and two neutrinos), and the other tau decays hadronically.

We study both contributions at once by looking at a $Z$/Drell-Yan + 2 jet Monte Carlo sample, where the $Z$ decays to leptons (either $e^+e^-$ or $\tau^+\tau^-$). In this Monte Carlo sample, there are 958 events where the $Z$ decays to electrons, both electrons are reconstructed in the CC and in addition two jets are found. In a data sample of the same integrated luminosity as used in the analysis we find 48 events that pass these requirements. This means that the integrated luminosity of the Monte Carlo sample is roughly twenty times bigger than the 92 pb$^{-1}$ used in the analysis.

If we now apply all the analysis cuts to this same Monte Carlo sample, we see that only 1 event survives. This includes the contributions from the $Z$ decaying to taus or electrons. As the integrated luminosity used for the analysis is only 5% of what is available in the Monte Carlo sample, the background from $Z$ events after all cuts is 0.05 ± 0.05 events, and can thus be neglected.