

Reconstructing dileptonic $t\bar{t}$ events (and doing stuff with them)

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Top pair production is one of the most widely studied interactions at the LHC and offers opportunities both to improve our understanding of Standard Model “parameters” like parton density functions and constrain or potentially discover new physics beyond the Standard Model.

An interesting family of observables in top pair production are angular correlations which can probe the spin correlations between the two tops and the polarisations of the individual tops themselves, both of which can be sensitive to new physics effects. The dileptonic decay channel is useful for studying spin correlation observables since the two leptons are experimentally very clean and straightforward to interpret. However for studying polarisations we need to fully reconstruct the individual top momenta which presents a challenge since we expect two hard neutrinos in the final state, which we only can detect as a single missing transverse momentum vector. We are therefore forced to figure out how to get reliable solution(s) for the two neutrinos out of this underconstrained kinematic system if we want to fully reconstruct the individual top momenta, keeping in mind that the method must be robust against the considerable noise present in real world LHC data.

In this talk I will focus on the so-called “MT2 Assisted On-Shell” (MAOS) neutrino reconstruction method, with some brief remarks about other methods currently in use. I will introduce the MT2 observable itself and show you how to calculate it. If time permits I will also briefly discuss some potential phenomenological applications of using this reconstruction to calculate observables.

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