Observation of S-Channel Single-Top-Quark Production at the Tevatron

Studies of the properties of the top quark are being actively pursued at the Fermilab’s Tevatron and at the CERN LHC. Besides top-antitop pair production by strong interaction, which is the most common production mechanism, the less common single-top production via electroweak interaction is now being tackled.

Collisions that produce a single top quark through the weak nuclear force are rarer, and the events are much less distinctive than top pairs. According to the Standard Model, single-top production can be induced by several amplitudes. Production through the exchange of a virtual W boson in the s-channel is very hard to isolate. This production channel is barely accessible at the Tevatron and is presently out of reach at the higher energy LHC. On the other hand, new physics effects might most readily show up in this channel. The observation of this production channel was one of the ultimate goals of the Tevatron.

The analysis methods adopted by the CDF and D0 experiments to isolate s-channel single-top quark production will be described. The speaker will illustrate the main analysis features, underling the challenges and describing the techniques employed in order to accomplish such a difficult task. The CDF and D0 results will be shown, claiming discovery by combining them.