Abstract
Supersymmetry provides a natural candidate for dark matter. A search for SUSY in final states with highly energetic jets, large momentum imbalance, and tau pairs is performed using data samples with a total integrated luminosity of 1143 pb⁻¹ of pp collisions at √s = 7 TeV collected with the CMS detector at the CERN Large Hadron Collider (LHC). The Standard Model (SM) backgrounds are estimated using data-driven techniques.

Supersymmetry
Supersymmetry (SUSY) introduces a new set of particles, a new fermion for every boson and a new boson for every fermion. If supersymmetry is correct, it is expected to be observed at the TeV scale, solving three important mysteries: a) it solves the problem associated with the Higgs mass, b) it connects the SM with an ultimate unification scale, solving three important mysteries: a) it produces a dark matter candidate, the neutralino. This decay mode has a branching ratio of near 100%. Thus, our signal is for a final state of Jets plus MET plus taus, where the taus are our “smoking gun”.

The Search for Supersymmetry

OS Minus LS Technique and Kinematic Endpoints
Although our event selection will show an excess of events in regions with high mHT, it does not provide information about the SUSY masses. For this, we employ the opposite sign minus sign (OS-LS) technique, which is effective at a) selecting the correct tau-tau pairs and b) removing fake backgrounds on a statistical basis.

Background Estimation

In order estimate our background contributions, we first create control regions with selections similar to our signal region but containing many more background events. From these regions, we can measure our selections efficiencies and extrapolate to our signal region. The selections are show in the analysis flow (above).

Summary
We have conducted a search for SUSY using 1143 pb⁻¹ of data. We used data-driven methods to estimate SM background contributions. We did not observe any excess in our signal region. That is, all results are consistent with the standard model.

The search continues! Even though we have not found an excess (yet), our analysis is robust and our methodology sound. The LHC is acquiring more data each moment and we will be ready to look again at a higher luminosity.