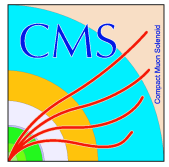

Muon-jet analysis update

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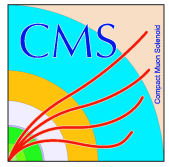
6 September, 2010

Status

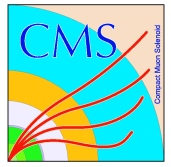
- Most 3_8_2 jobs have completed; now I'm calculating integrated luminosities (a few of the jobs have failed, and we have a lot more samples now), making file lists for processing the output, and documenting all the new information on the ExoticaMuonJets twiki page (which has become my lab notebook for this analysis)
- List of new samples:
  - 2.2 pb^{-1} of data, 2 clean muon skim
  - InclusiveMu5_Pt* ($30 < \hat{p}_T < \infty$), skimmed (same background Monte Carlo as before)
  - ppMuX and self-generated ppMuMuX (with loose generator-level cuts) to cover $\hat{p}_T < 30$ region (could explain the low-mass dimuon excess seen in data)
  - Drell-Yan: self-generated 0.2–5, 5–10, and official 10–20, 20–∞ samples
  - J/ψ, $\psi' \to \mu\mu$, $\psi' \to J/\psi$ samples
  - only the most important muon-pair guns
  - Extra-$\mathcal{U}(1)$ and NMSSM models (one m_h, m_a point)

Status (continued)



- Samples now contain full trigger information and trigger matching for clean muons ((TrackerMuon with $p_T > 5$ GeV/c, $|\eta| < 2.4$, 2 or more arbitrated segments) **or** GlobalMuon **or** StandAloneMuon)
  - can improve technique for ignoring muons solely responsible for trigger in plots
  - trigger matching parameters: $\Delta R < 0.5$, $|\Delta p_T|/p_T < 50\%$, resolve ambiguities to minimize ΔR, only consider clean muons
  - same as MC-matching parameters except for clean muon requirement
- Muons drawn from standard muon collection (with the last sample, I verified that what we need is a subset of the standard collection); there's a clear path for this becoming an AOD-based analysis

Plans



- Repeat analysis with the new samples
  - finalize GlobalMuon inefficiency-in-barrel study
  - low-level data/MC comparison with the latest tracking and alignment
  - find out if new samples fill in gaps in high-level data/MC comparison
- Summarize everything as a poster at CMS Physics Week (Bodrum)
- Update and clean up the note
  - new version should be more focused (no more legacy plots which weren't the right thing to look at: I'm only going to re-make the useful plots)
  - should indicate a clear path from start to finish: be a zeroth draft of the final paper
- Test backgrounds-from-data idea (next page)

Estimating backgrounds from data

- Assumptions:
  - most SM backgrounds in 4-μ channel are pairs of heavy quarks (b or c), each decaying to 2+ muons through two Ws, a neutral resonance (J/ψ) or both
  - the decay chain of each heavy quark is statistically independent of the other one (no CP correlations at hadron colliders, right?)
  - we can accurately subtract Drell-Yan from the inclusive distributions
- Method:
  1. select events with at least two well-separated muons, called tags (e.g. pair mass > 15 GeV/c^2 or $\Delta R > 0.5$); remove Drell-Yan to leave only heavy quark pairs
  2. measure the fraction that have a second or third muon in close proximity to one of the tags; this is the conditional probability that the heavy quark will decay into two or more muons, given that it decays into at least one
  3. square this probability to estimate the number of "2+ muon, 2+ muon" events relative to the number of "1+ muon, 1+ muon" events