Effect of JetID Cuts in Data and MC at 900 GeV MinBias Collisions

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Outline

- Motivation
- Data Sample and Event Selection
- JetID Cuts Efficiencies for Dijet
- JetID Cuts Efficiencies for Inclusive Jet
- Conclusion

Motivation

- Explore the effect of the JetID cuts in the Dijet and Inclusive Jet analyses that are being approved
  - ✓ CMS AN-2010/009, "Jet Commissioning using Di-Jet Events from 900 GeV and 2360 GeV Collision Data" (v3 on February 1).
  - ✓ CMS AN-2010/019, "Inclusive Jet Stuies with 900 GeV Collisions" (v3 on February 2).
- Show "observed efficiencies" of these cuts as a function of jet Pt in data and MC.
  - ✓ The effect of the cut on the data and MC.
- Support the dijet and inclusive jet analysis by providing this information.
  - Caution: The observed efficiencies do not match Calojet to Genjets. The efficiency when to matching to Genjets is higher.

Data Sample and Good Run List

[900 GeV]

Run	LS
123596	2 - 9999
123615	70 - 9999
123732	62 - 109
123815	8 - 9999
123818	2 - 42
123908	2 - 12
124008	1 - 1
124009	1 - 68
124020	12 - 94
124022	66 - 179
124023	38 - 9999
124024	2 - 83
124025	5 - 13
124027	24 - 9999
124030	2 - 9999

- Run and LS list recommended for the JetMET analyses
  - ✓ Run 123906 is also used for Dijet and Inclusive Jet Analyses.
- Data
  - ✓ /MinimumBias/BeamCommissioning09-Jan23ReReco-v1/RECO
- MC
  - ✓ /MinBias/Summer09-STARTUP3X_V8P_900GeV-v1/GEN-SIM-RECO
- Trigger
  - ✓ TT0: indicates consistent timing with LHC bunch crossing
  - ✓ TT40 || TT41: indicates coincident activity in the forward and backward beam scintillators
  - ✓ NOT (TT36 || TT37 || TT38 || TT39): to filter events originating from beam halo
  - ✓ HLT PhysicsDeclared

Event Selection for CaloJets

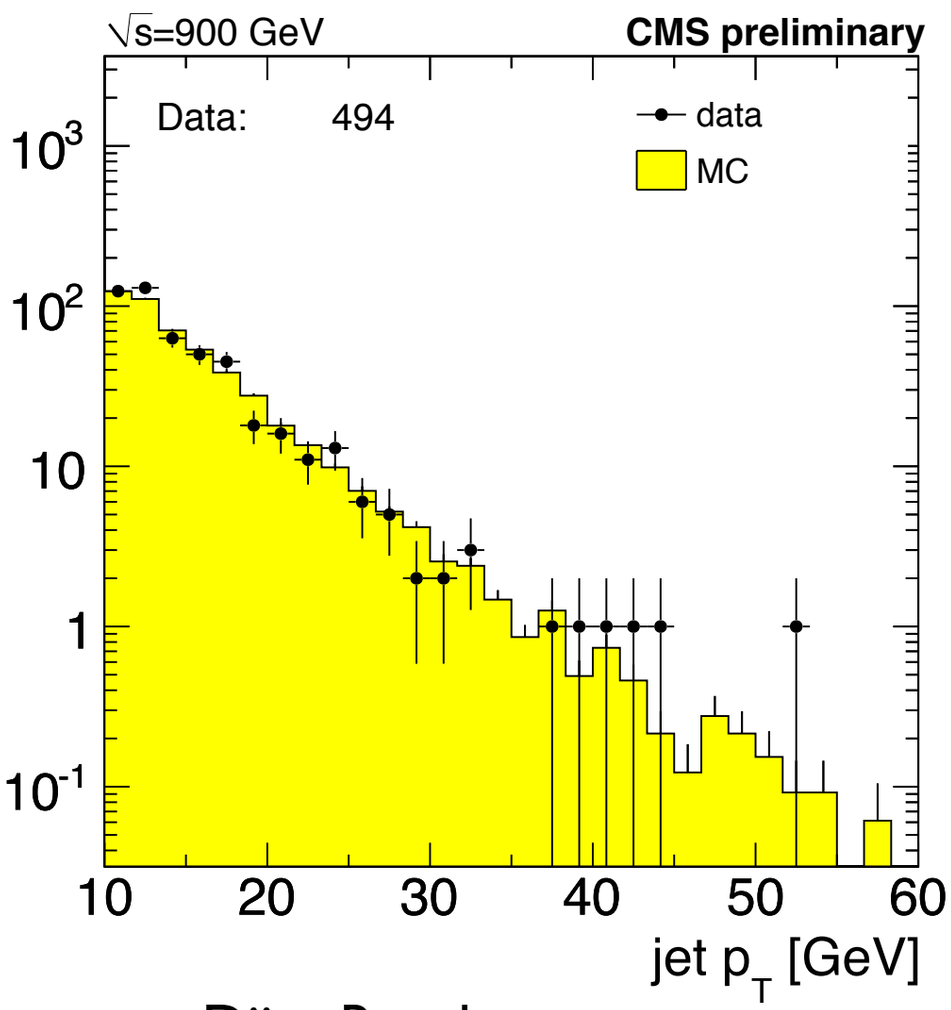
- **Dijet Analyses**
  - ✓ |PVz|<15
  - ✓ PVntracks>3
  - ✓ NJets>1
  - ✓ Both |Jet η|<3
  - ✓ Both Jet Pt>10 GeV
  - ✓ $|\Delta\Phi-\pi|<1$
- Standard Loose JetID Cut for both jets
  - ✓ (|Jet η|>2.6 || EMF>0.01)
  - ✓ fHPD<0.98
  - ✓ n90Hits>1

- **Inclusive Jet Analyses**
  - ✓ |PVz|<15
  - ✓ PVntracks>3
  - ✓ |Jet η|<2.6
  - ✓ Jet Pt>15 GeV
- Special Tight JetID Cut
  - ✓ EMF>0.01
  - ✓ n90Hits>4
  - ✓ fHPD, fRBX<0.98
  - ✓ σ_η, σ_Φ >0.01

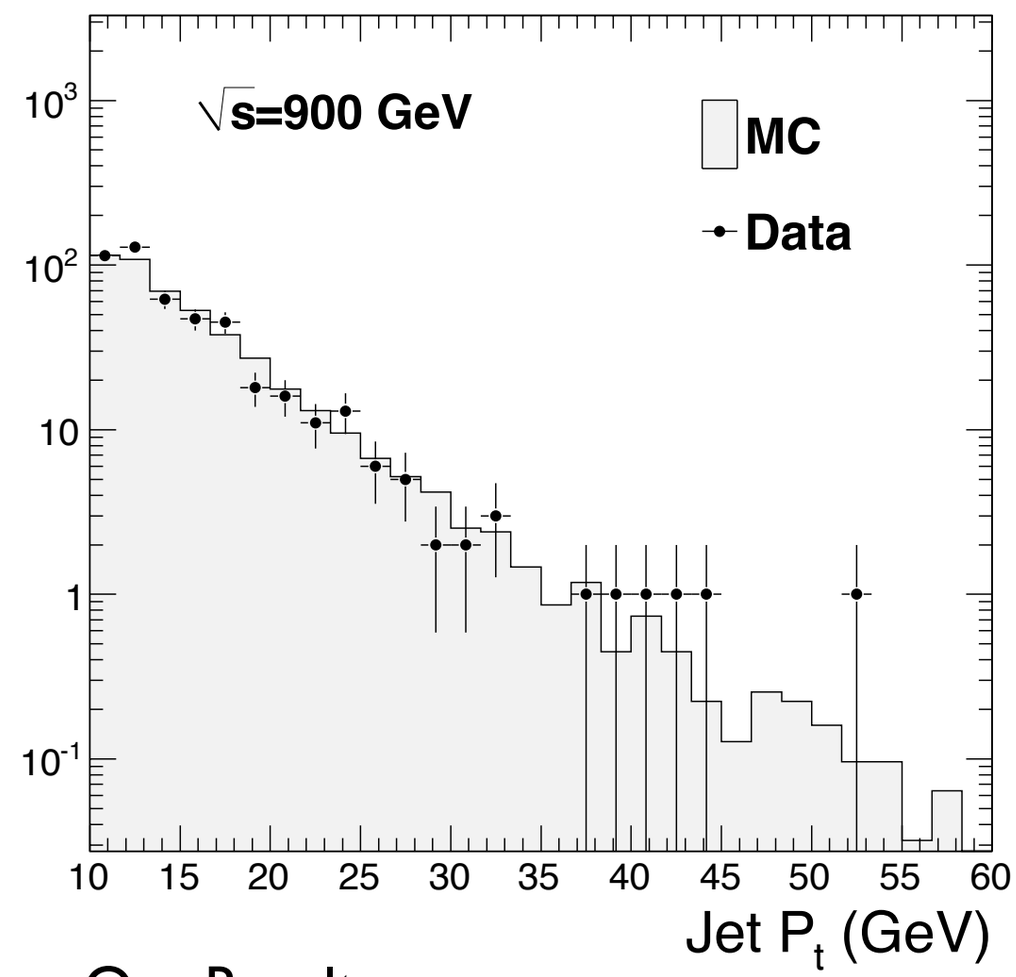
JetID Cuts Efficiencies for Dijet

Comparison of Pt Distributions

- First we would like confirm that our Pt distribution is consistent with the Dijet Analyses.
- Out Pt distribution is almost indistinguishable from the Pt distribution in the analyses after applying the "Standard Loose Cut".



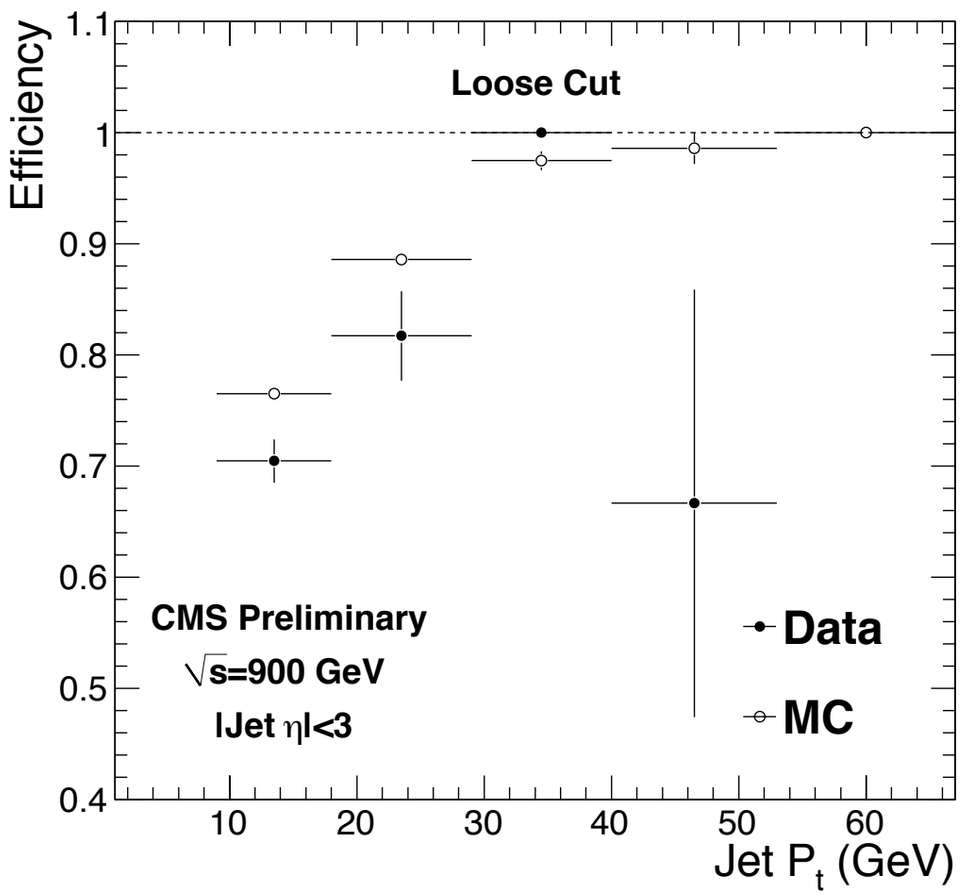
Dijet Result



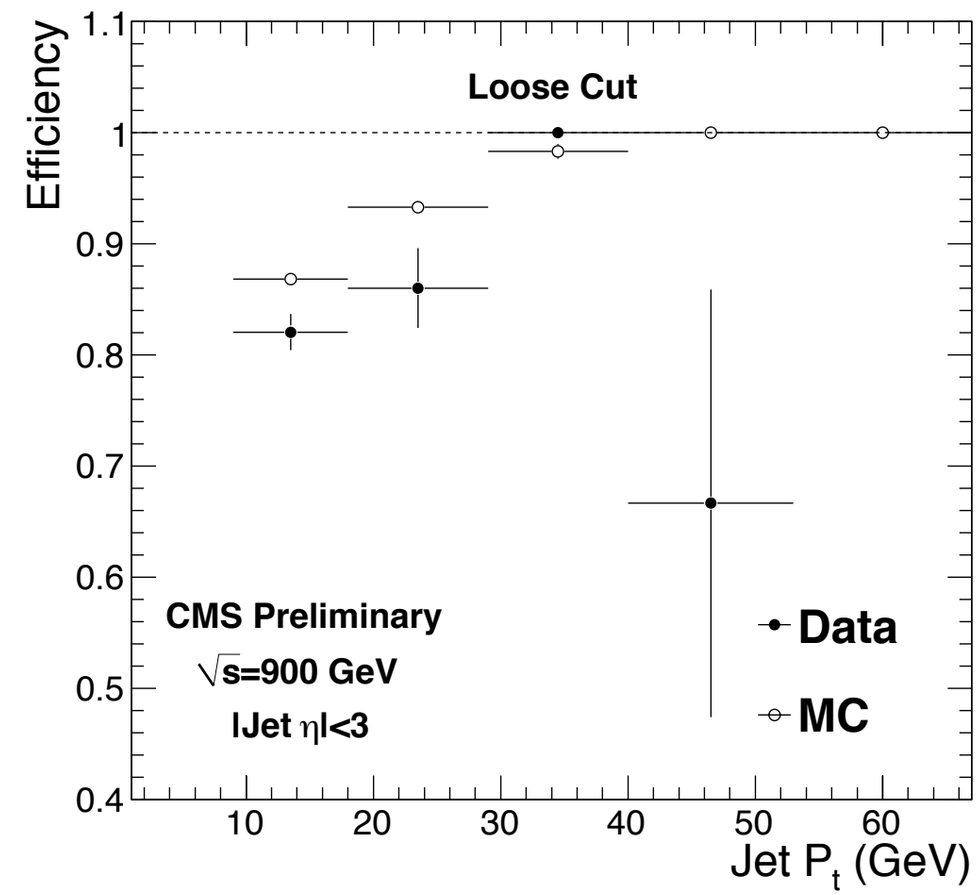
Our Result

The Standard Loose Cut Efficiency

- (|Jet η|>2.6 || EMF>0.01) && n90Hits>1 && fHPD<0.98
- Data and MC efficiencies are "pretty close" because Dijet sample is pure.
- MC efficiencies approach 1 at high Pt.



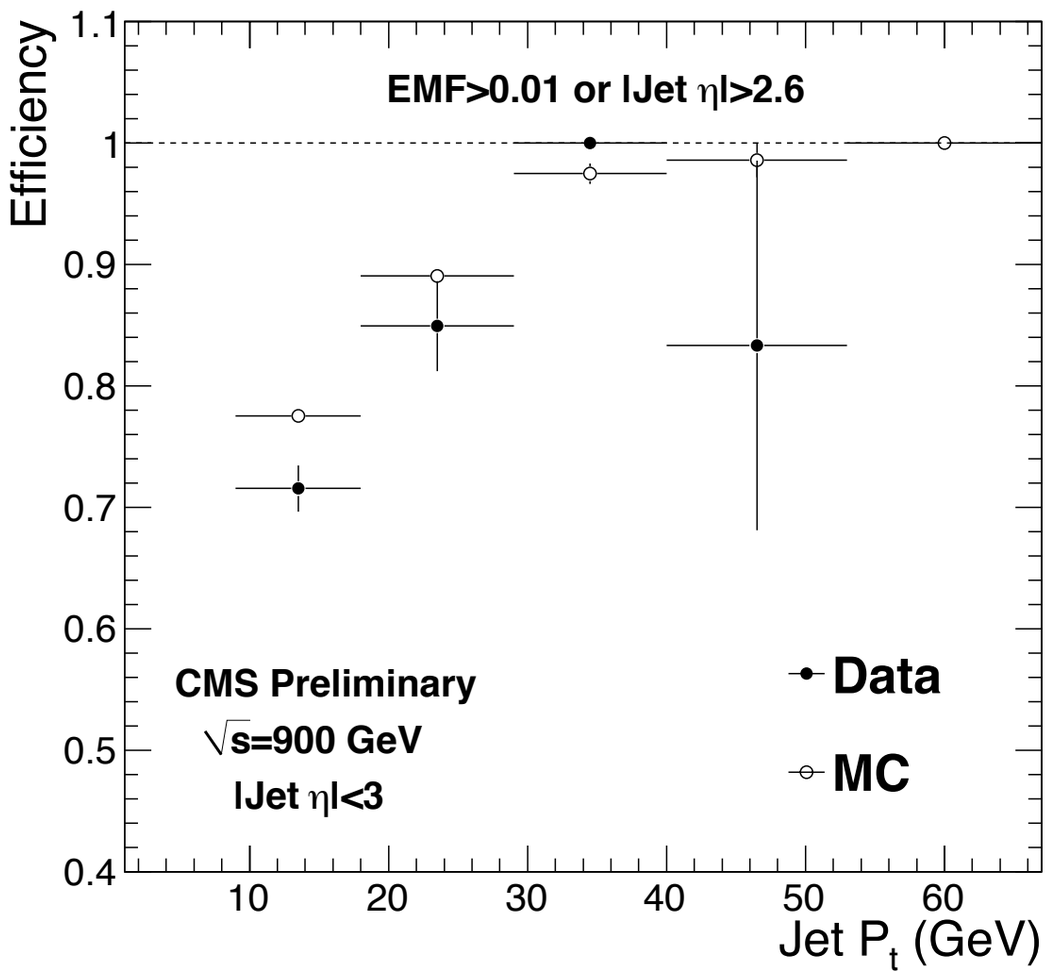
Dijet Event Efficiency: Required both jets to pass the cut



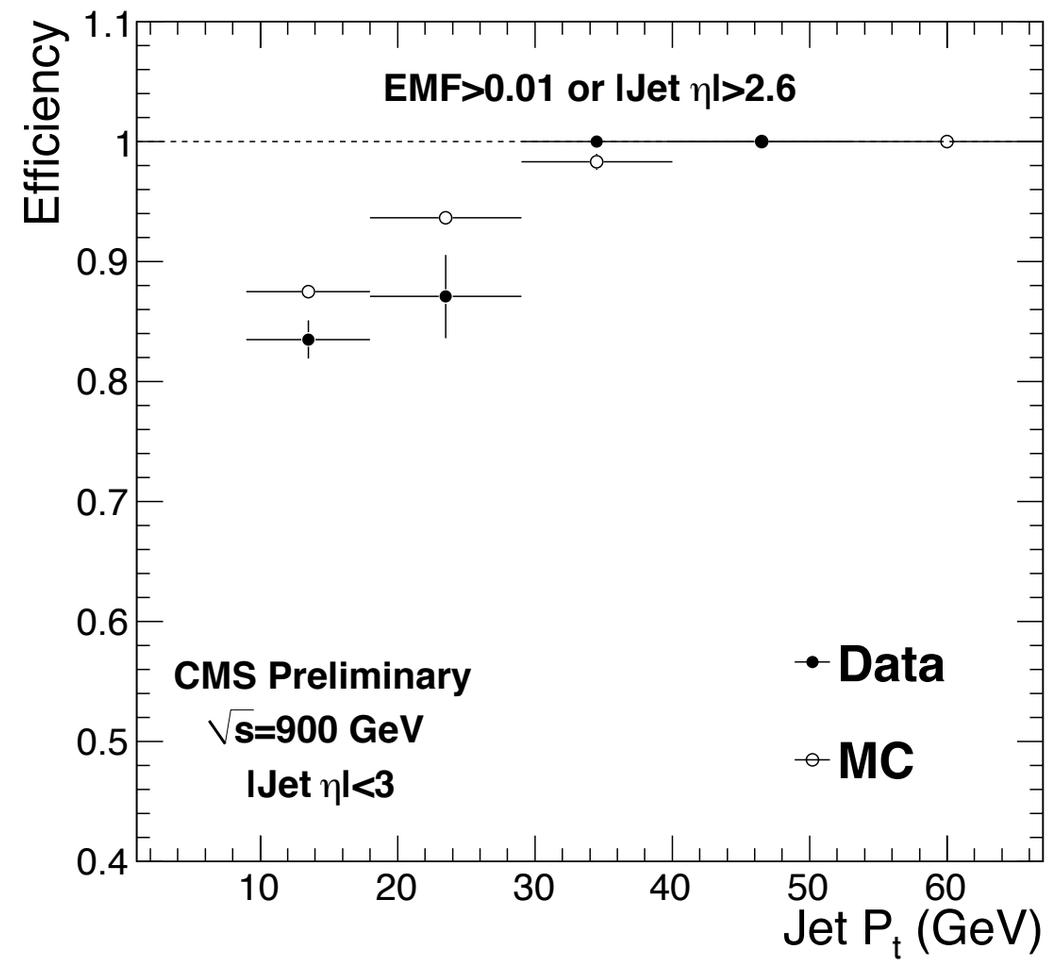
Jet Efficiency: Required either jet to pass cut

Minimal EMF Cut

- EMF>0.01 or |Jet η|>2.6 to reject HCAL noise
- Most of the inefficiency is coming from this cut



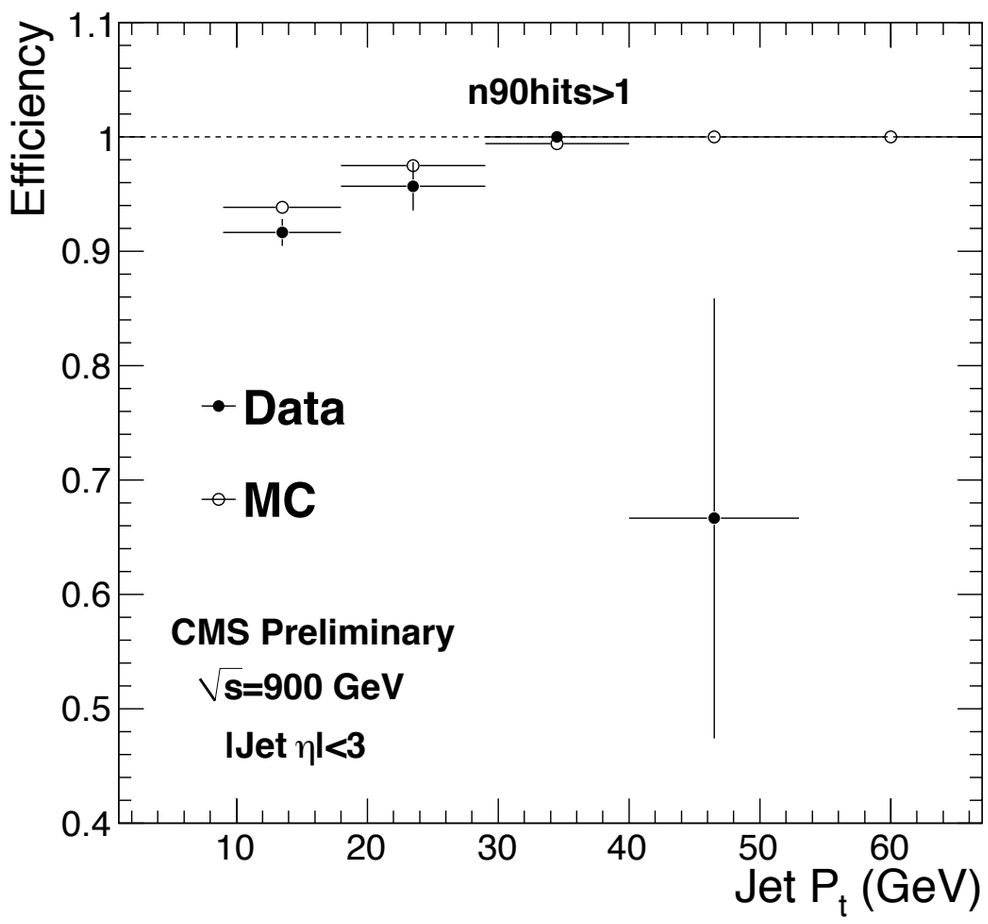
Dijet Event Efficiency: Required both jets to pass the cut



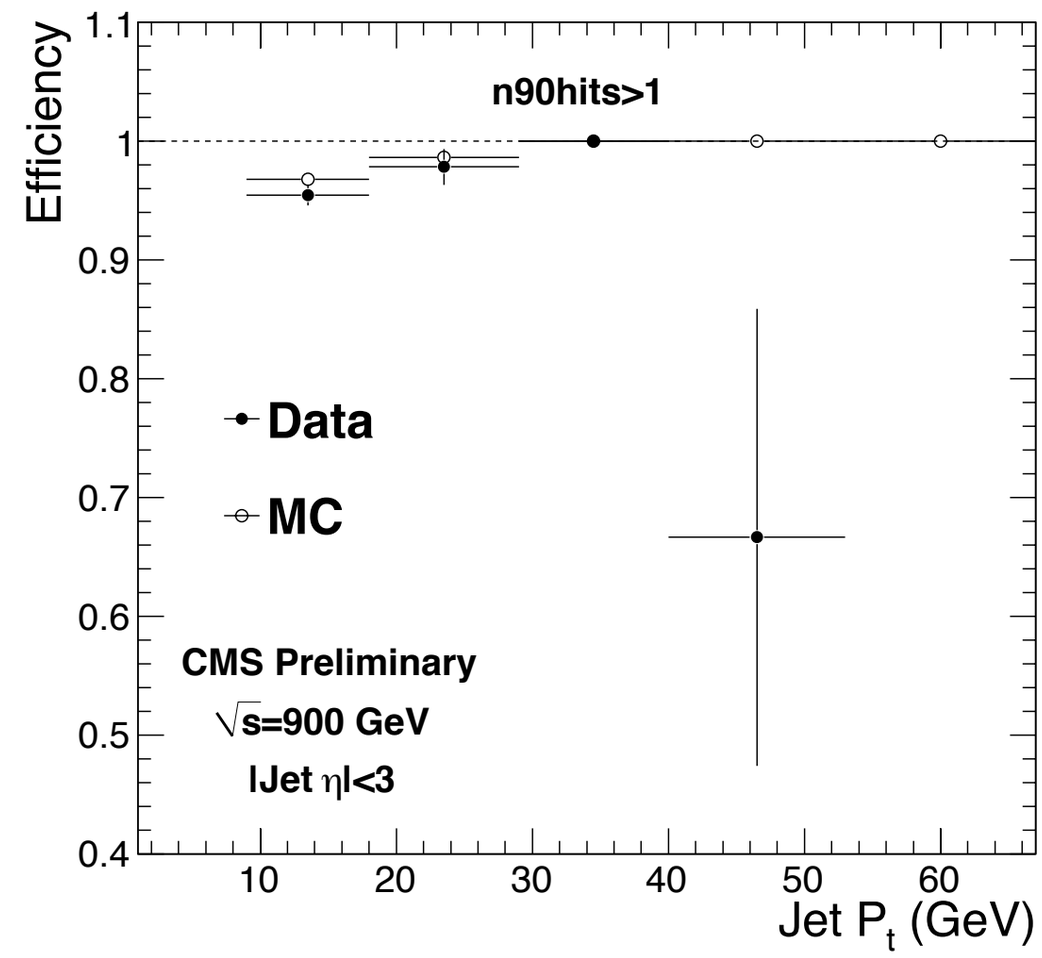
Jet Efficiency: Required either jet to pass cut

n90Hits Cut Efficiency

- n90hits>1 to reject fake jets from single hot cells.
- This cut is removing ECAL noise at high Pt.



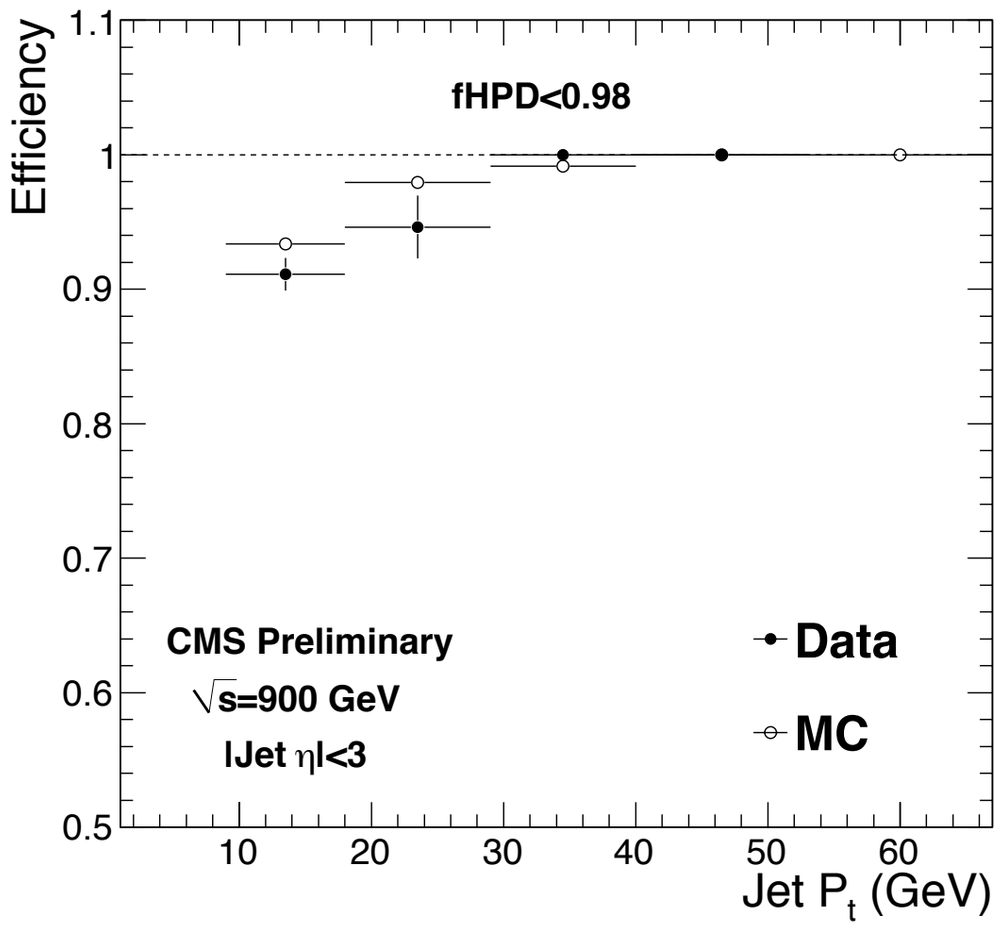
Dijet Event Efficiency: Required both jets to pass the cut



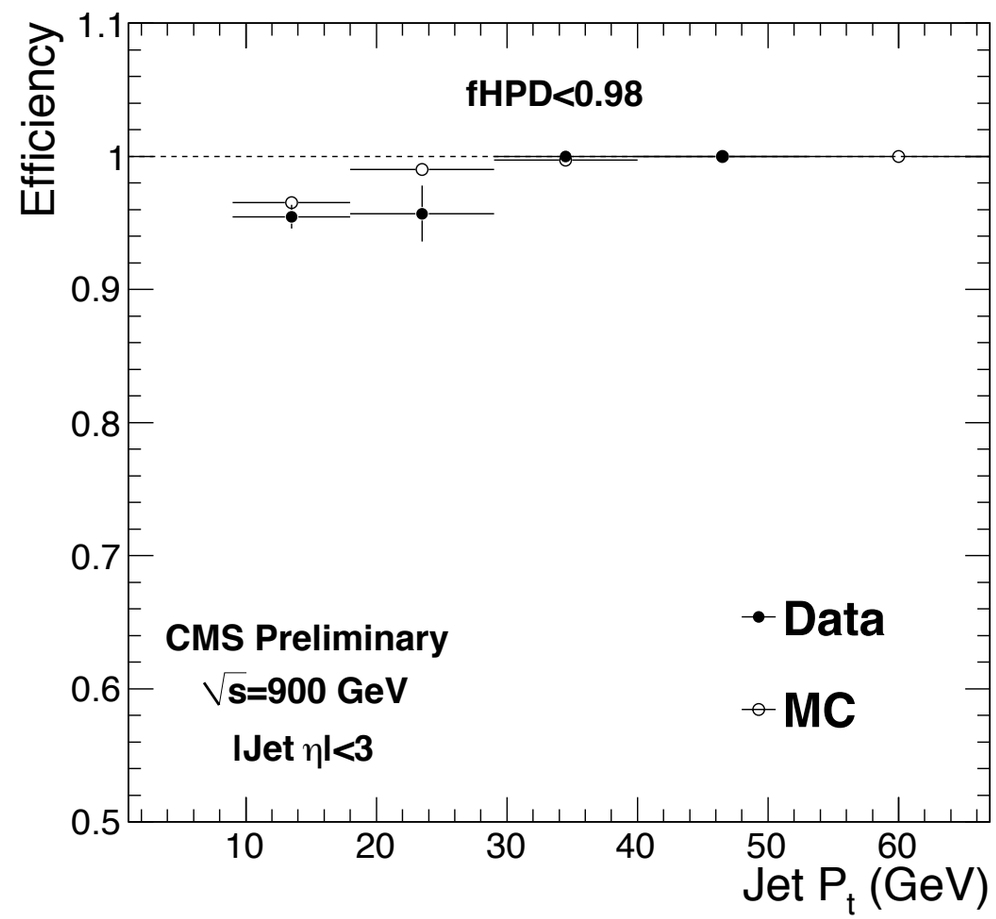
Jet Efficiency: Required either jet to pass cut

fHPD Cut Efficiency

- fHPD<0.98 to protect against noisy HPDs.



Dijet Event Efficiency: Required both jets to pass the cut

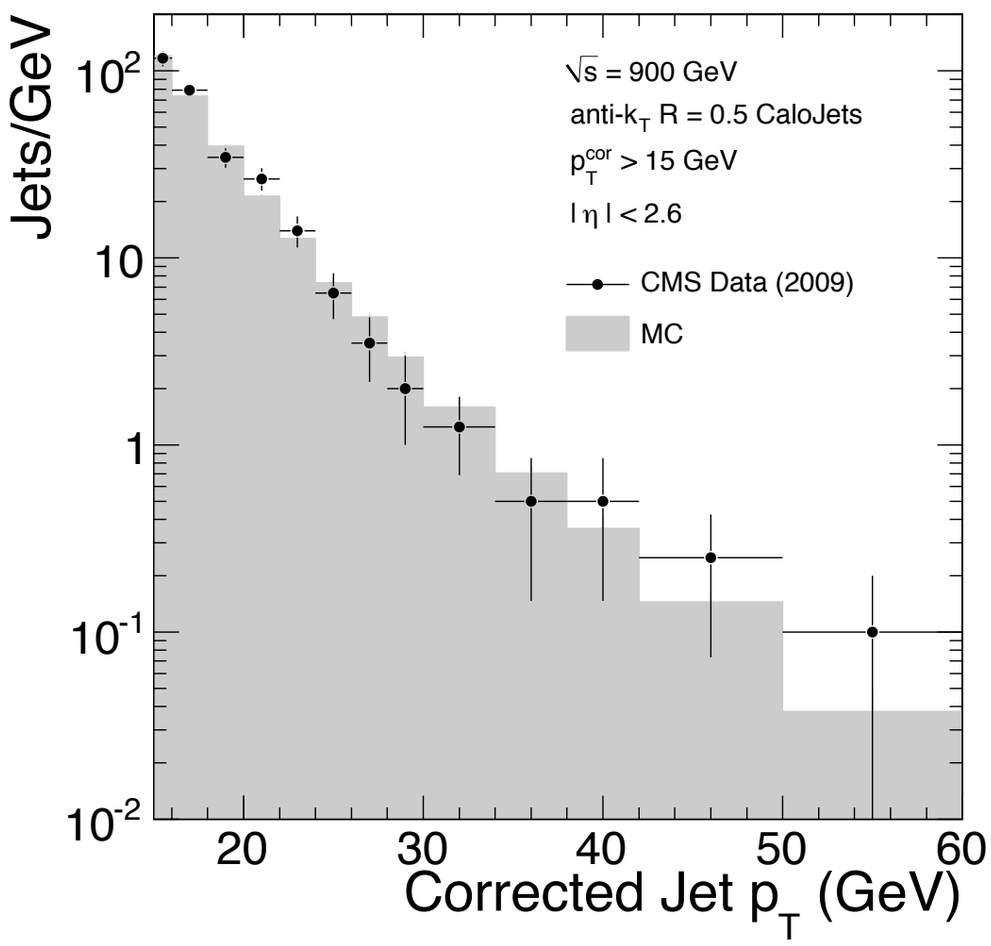


Jet Efficiency: Required either jet to pass cut

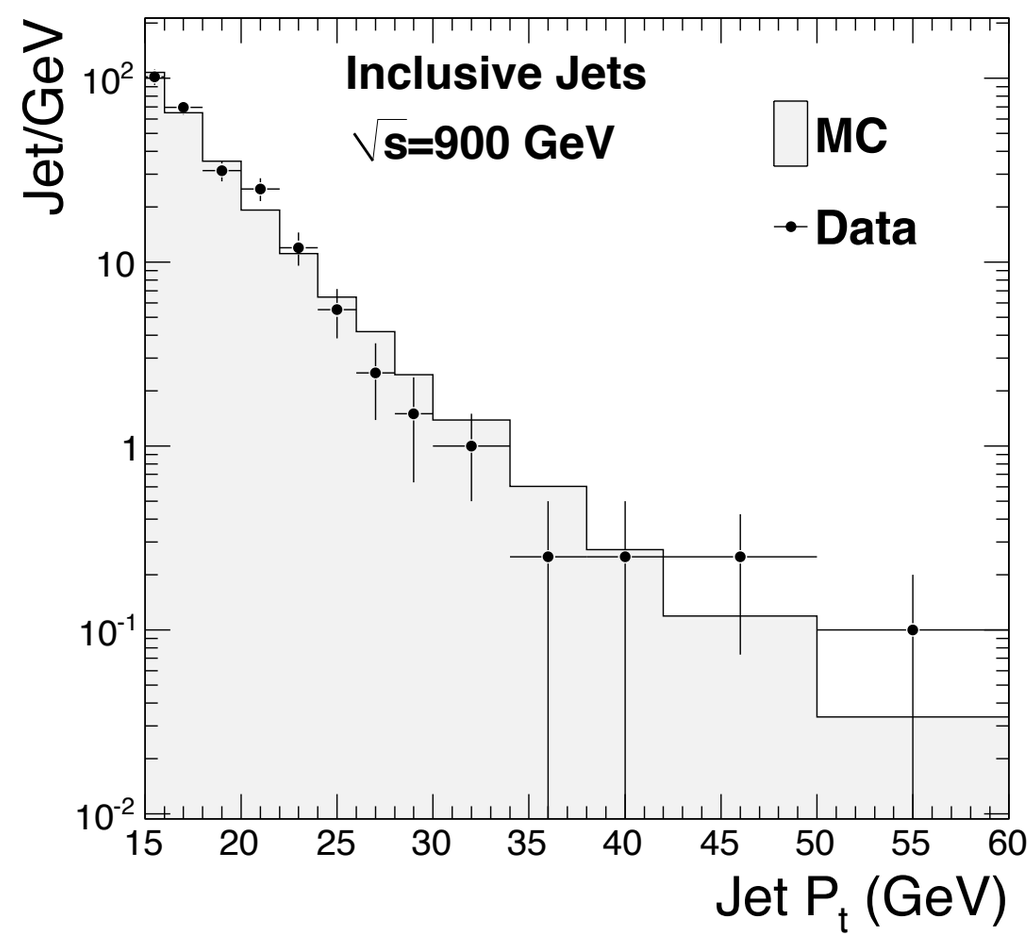
JetID Cuts Efficiencies for Inclusive Jet

Comparison of Pt Spectrum

- We want to confirm that our Pt spectrum is similar with the Inclusive Jet analyses result.
- Our results is almost the same with another one after applying cuts.
  - ✓ Our analysis used LS ranged and didn't use Run 123906.



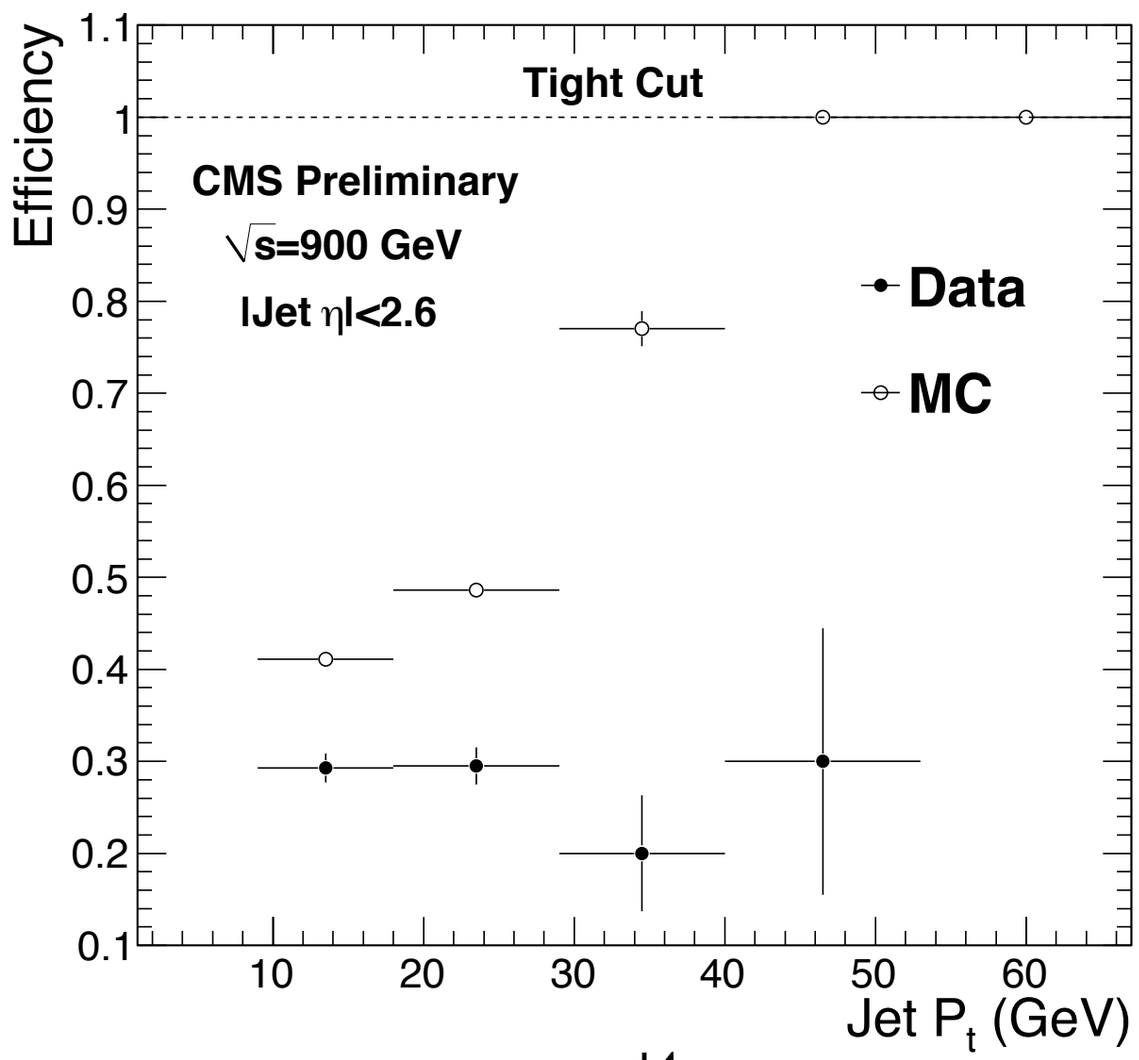
Inclusive Jet Result



Our Result

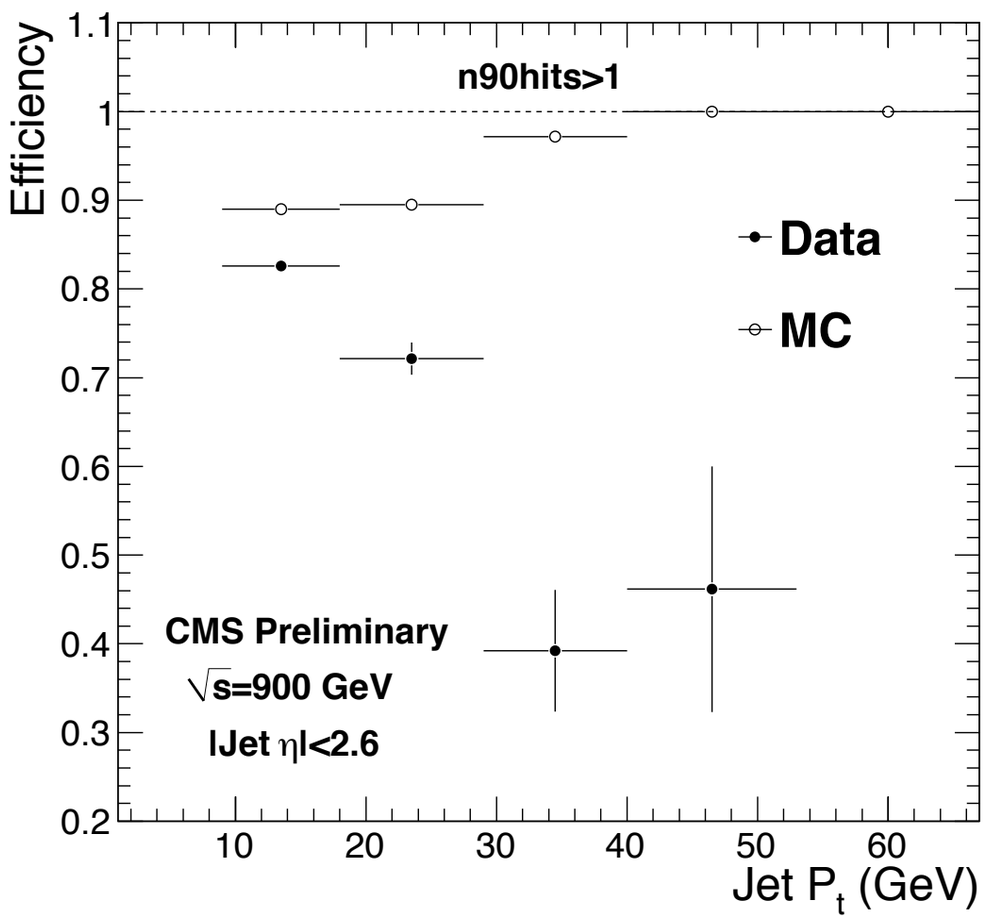
Special Tight Cut Efficiency

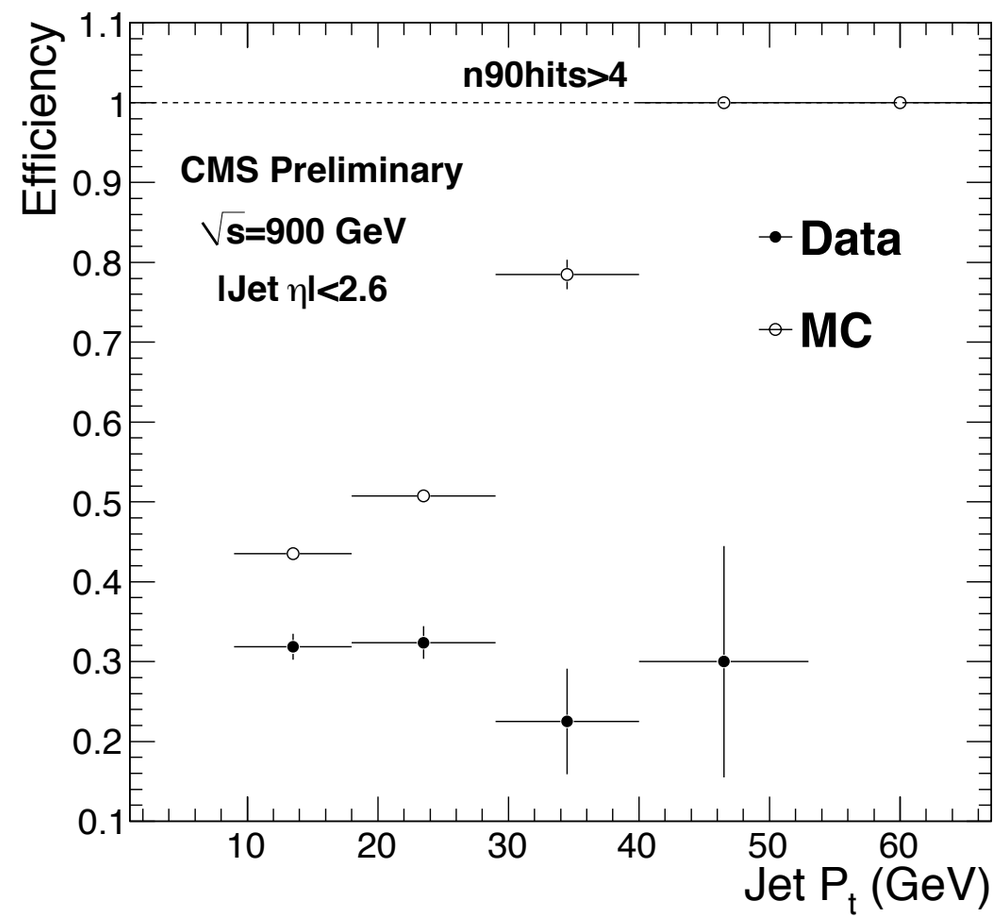
- Shows efficiency as a function of corrected Pt after applying following cuts
  - ✓ EMF>0.01, n90Hits>4, fHPD & fRBX<0.98, σ_η & σ_Φ >0.01
- Data and MC efficiencies are very different because Inclusive Jet sample is NOT pure.
- MC efficiencies approach 1 at high Pt.



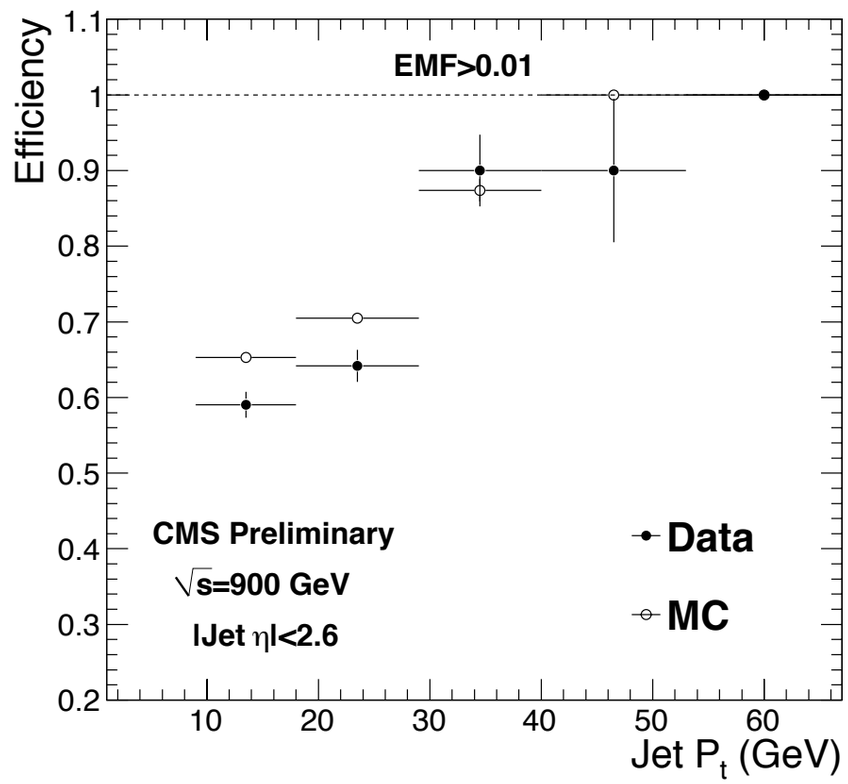
n90hits Cut Efficiency

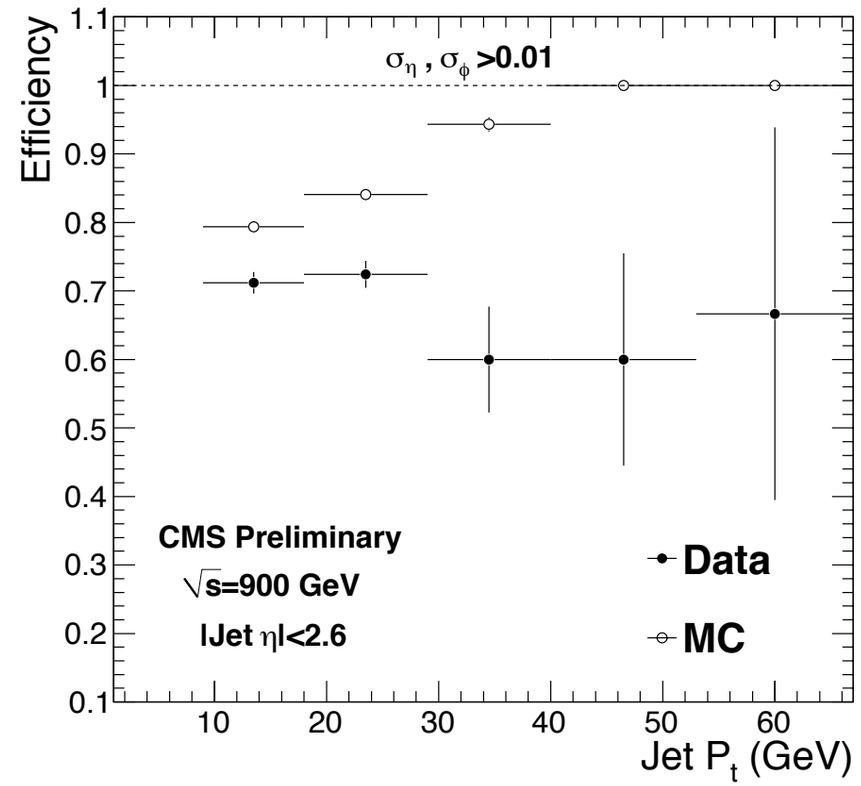
- Shows comparison of efficiency for different n90hits cuts.
- Greater n90hits cut remove more events in lower jet Pt range.

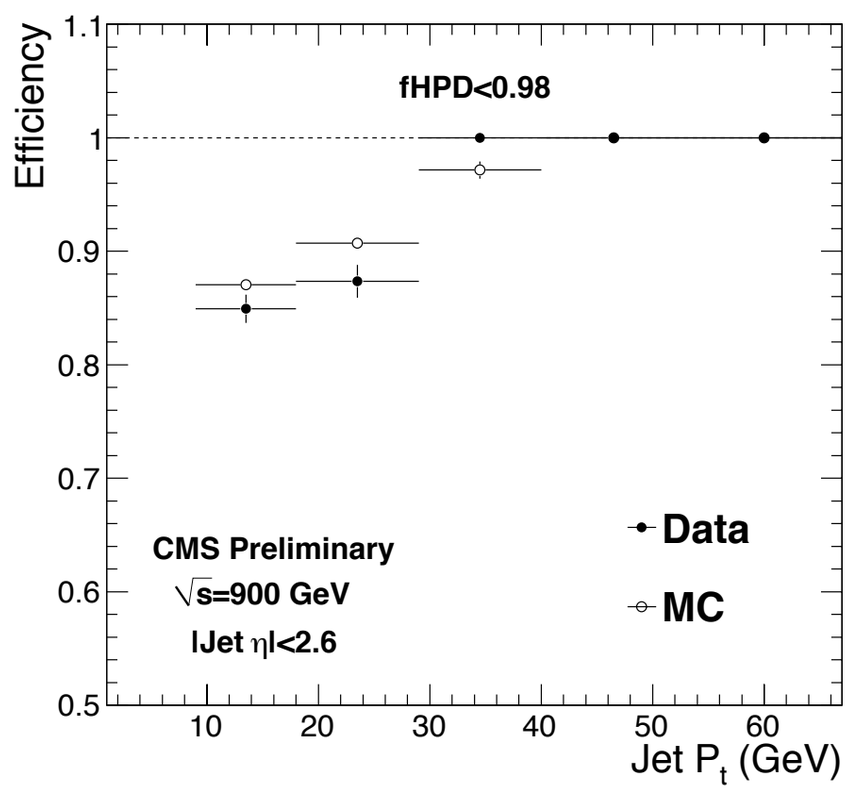


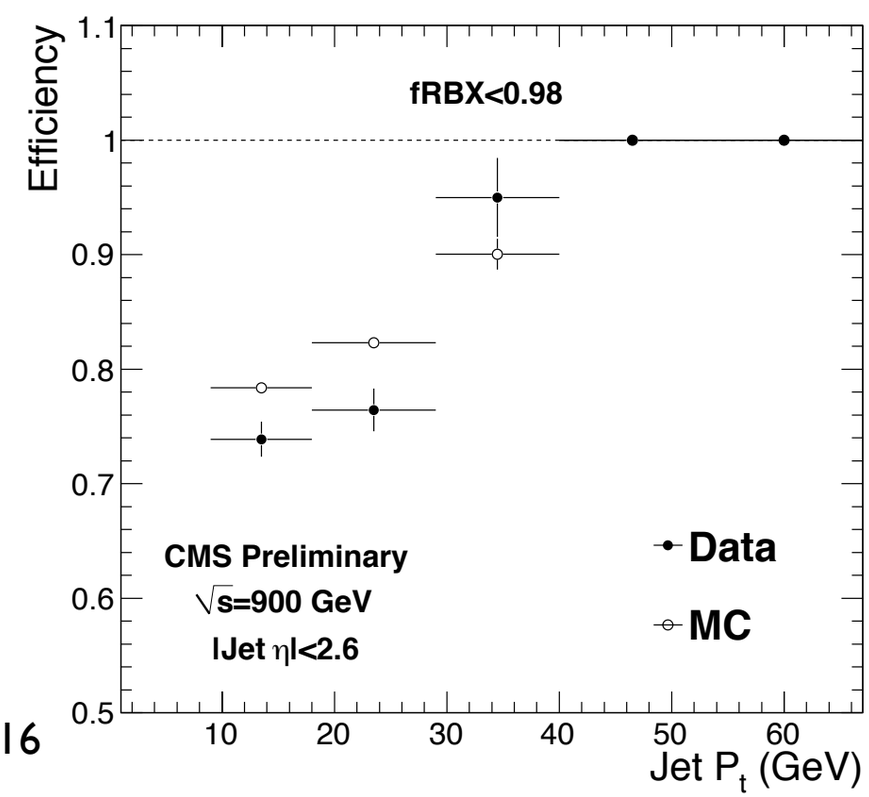


Other JetID Cuts Efficiencies









Conclusion

- Dijet sample is pure and only uses Loose JetID cuts for safety and to kill ECAL noise.
  - ✓ JetID Cuts reject similar number of jets in data and MC as a function jet Pt.
- Inclusive jet analysis has more background and uses Tighter cuts.
  - ✓ JetID Cuts reject many more jets in data than in MC and behave differently as a function of jet Pt.
- Both MC efficiencies approach 1 at high Pt.
- The Analysis note based on this study (and more) being prepared.