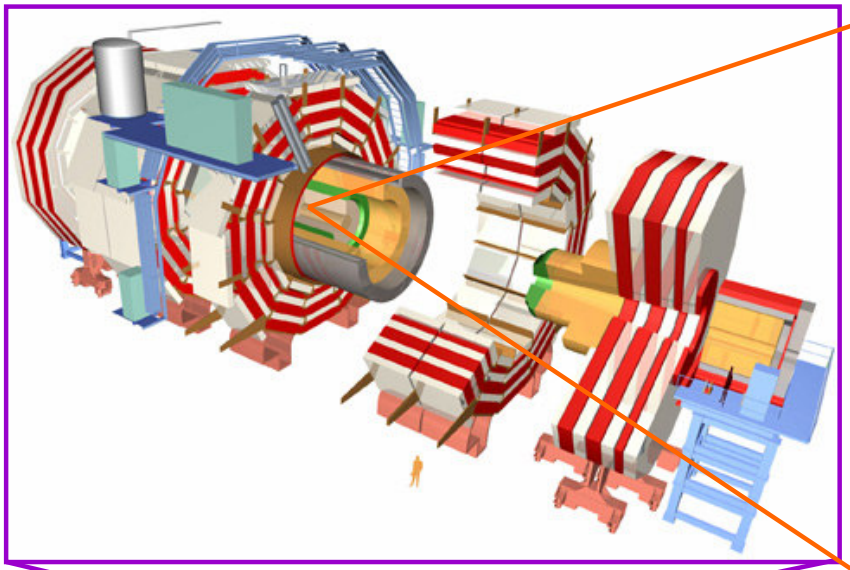
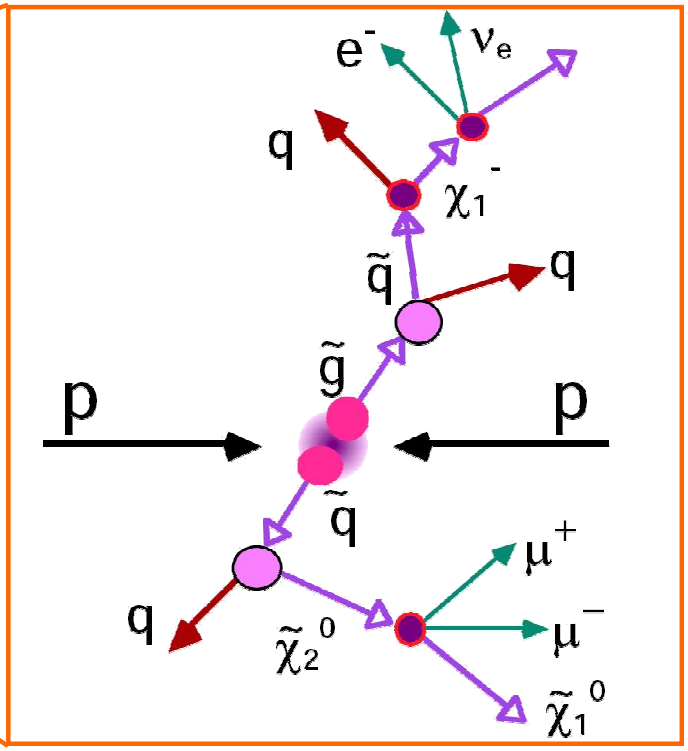
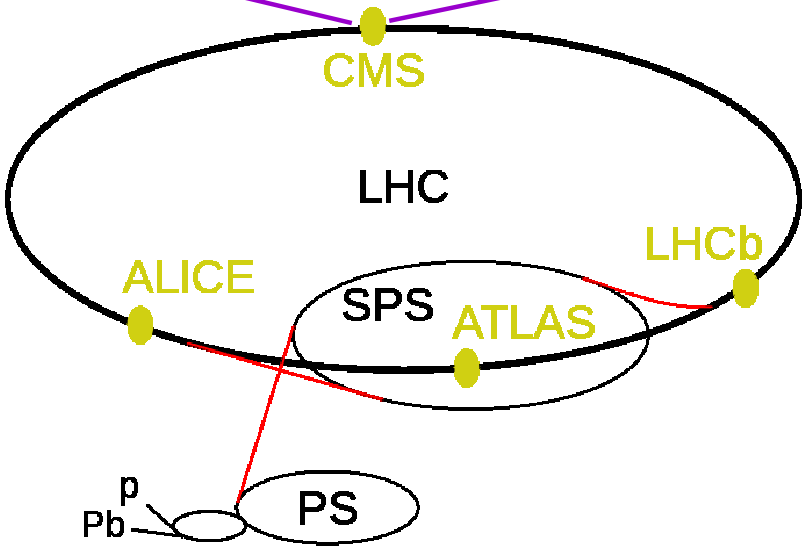
Statusreport : SUSY μ + Jets + MET







Outline :

- Baseline MuonID for SUSY selection
- Trigger Study
- Other issues

MuonID

Q : Why not use „Baseline MuonID" ?

- started with CMSSW_2 SUSY analysis
- using cuts from CMS AN-2008/034

Proposed Baseline Muon Selection

C. Hill, V+jets Meeting 23. Jan. 2009

- **$|\eta| < 2.1$**, single muon triggered analyses
  - $|\eta| < 2.4$, additional muons in multimuon analyses (or non-muon triggered analyses)
- **Muon ID** as recommended by Muon POG in AN-2008/098
  - `GlobalMuonPromptTight` (normalised $\chi^2 < 10$)
  - $|d_0| < 2$ mm (intentionally loose to keep μ's from b's)
    - Tighter cut, $|d_0|/\sigma_{|d0|} < 3$ if only want prompt μ's
  - nHits ≥ 11
- **Combined Relative Isolation**
  - A*TrkIso + B*EcalIso + C*HcalIso, use A=B=C=1
  - Compute from IsoDeposits produced during standard Muon reconstruction sequence (available in RECO,AOD,PAT)
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  - Use $\sum p_T/p_T < x$ functional form
  - Cut value, x, TBD by analysis
  - Check energy contained in veto cone is consistent w/ that of MIP (when available)

3

Definitions

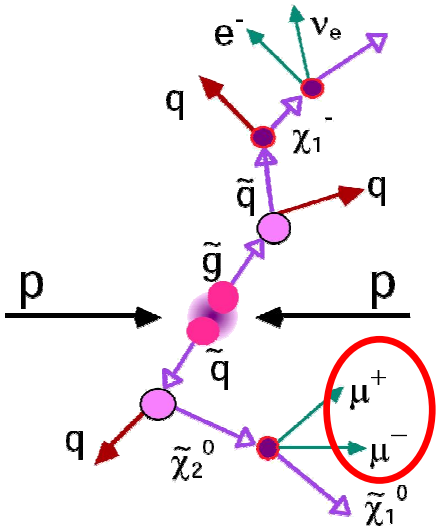
selectedLayer1Muons

Truthl ?
(stable truth muon)

No truthl ?
(stable truth muon)

Prompt ?
(in decay chain of hard interaction)

Non-prompt ?
(in decay chain of hadrons)



Are we efficiently selecting prompt muons ?

Baseline MuonID

Proposed Baseline Muon Selection

C. Hill, V+jets Meeting
23. Jan. 2009

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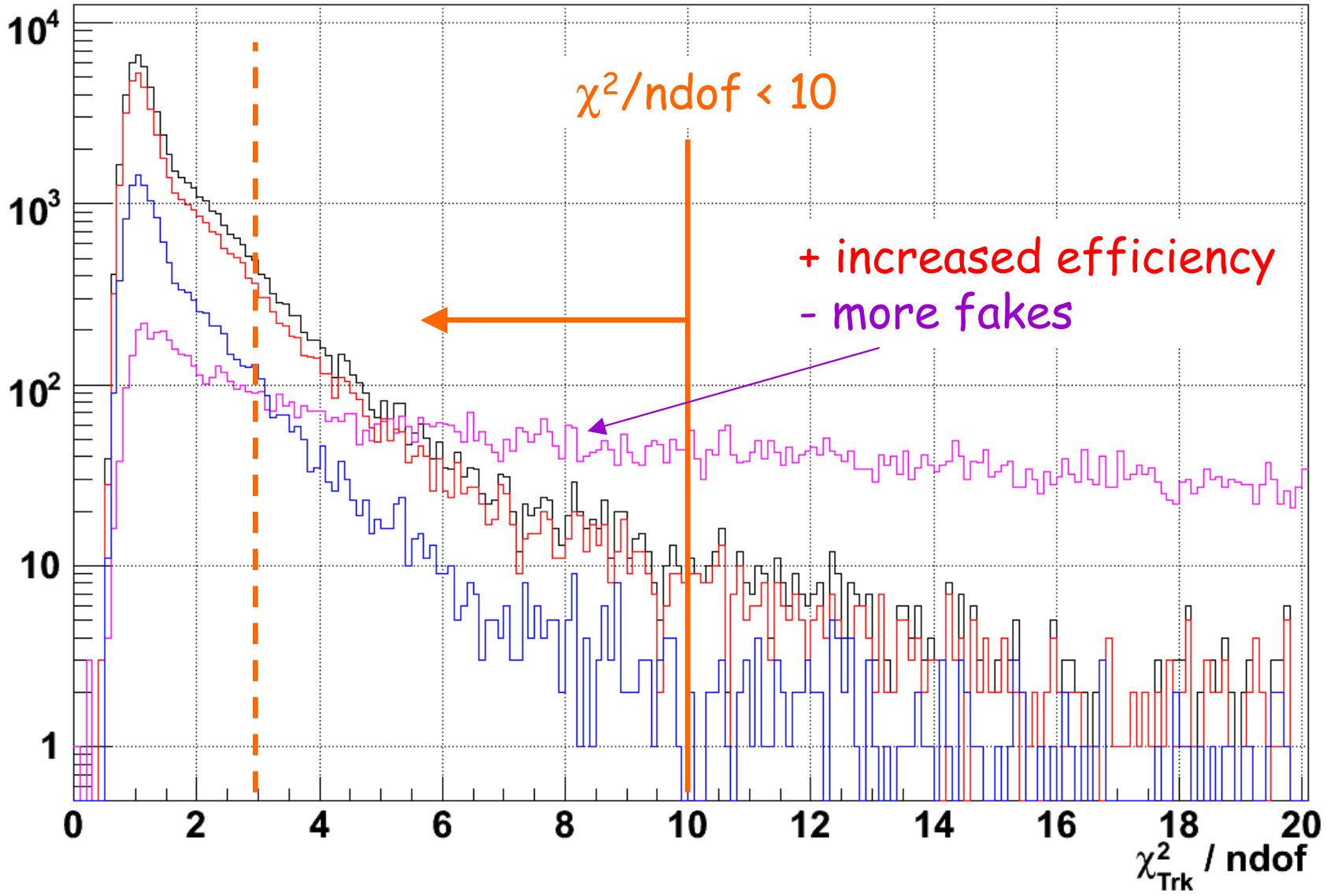
GlobalMuonPromptTight

Im1



Baseline MuonID

Proposed Baseline Muon Selection

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23. Jan. 2009

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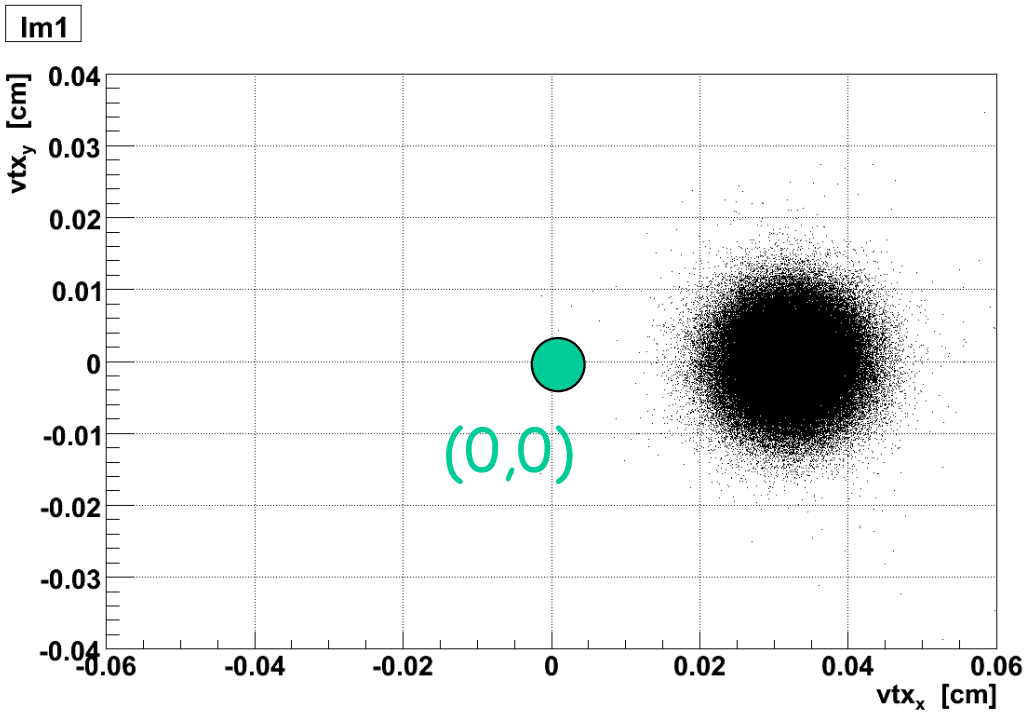
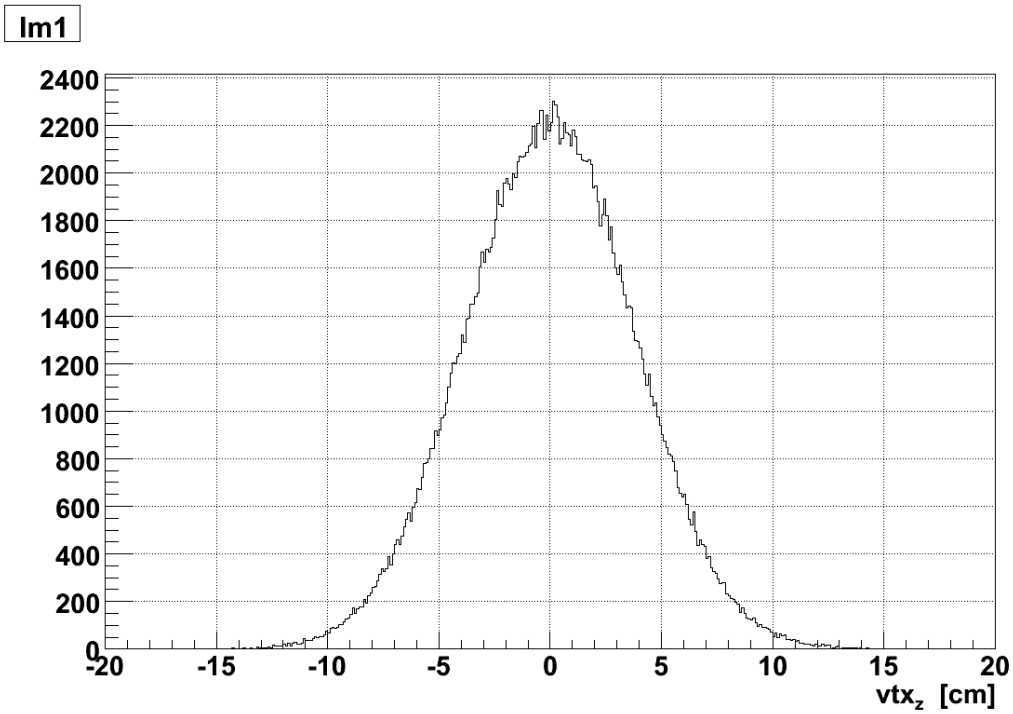
Vertex





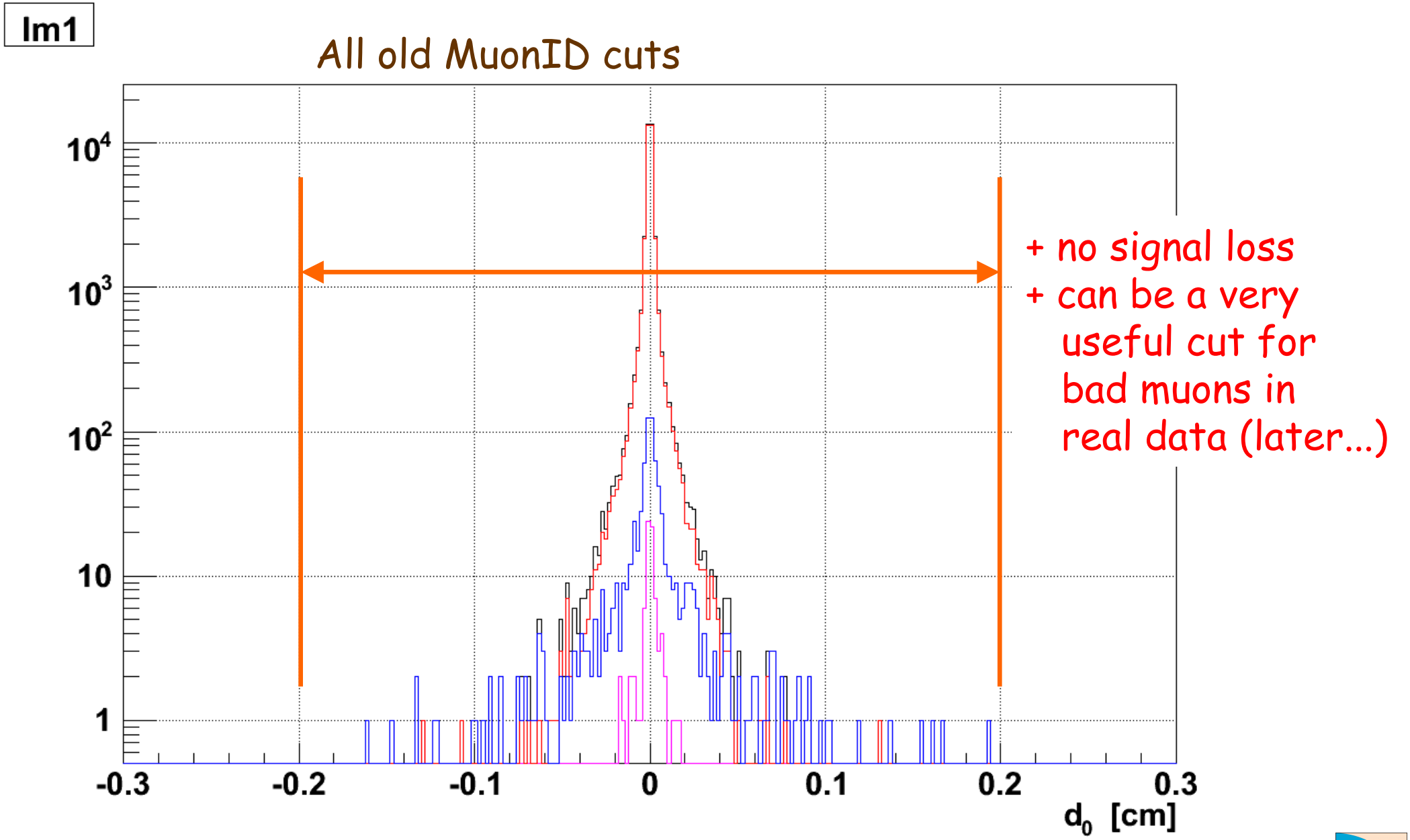
Summer08/Fall08 sample :

Vertex position shifted along x-axis 300μm

-> got weird d0 (impact parameter) distribution

-> correct for shifted vertex (thanks to Frederic)

Impact Parameter



+ no signal loss
+ can be a very useful cut for bad muons in real data (later...)

Baseline MuonID

Proposed Baseline Muon Selection

C. Hill, V+jets Meeting
23. Jan. 2009

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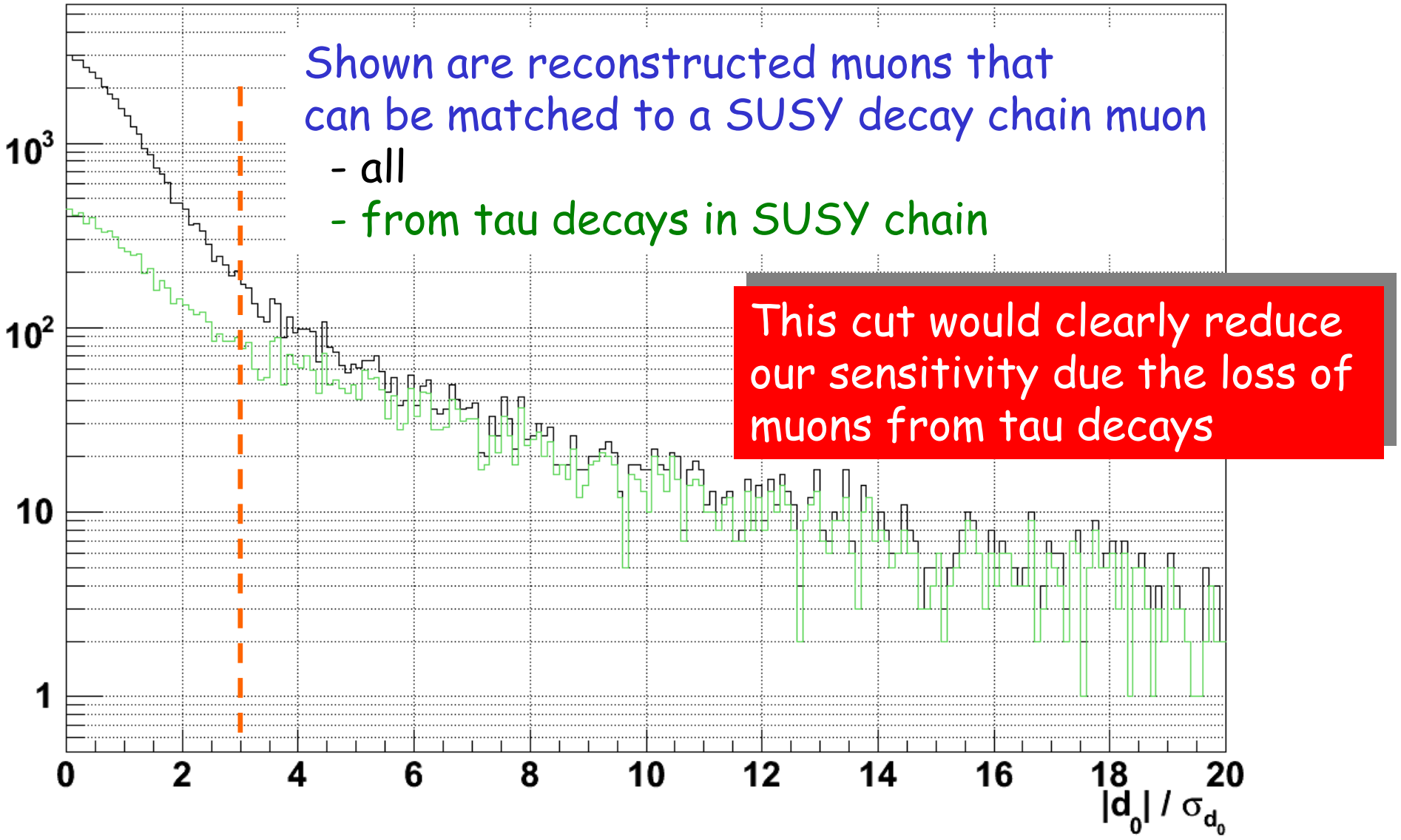
Relative Impact Parameter

lm1

All new MuonID cuts



Baseline MuonID

Proposed Baseline Muon Selection

C. Hill, V+jets Meeting
23. Jan. 2009

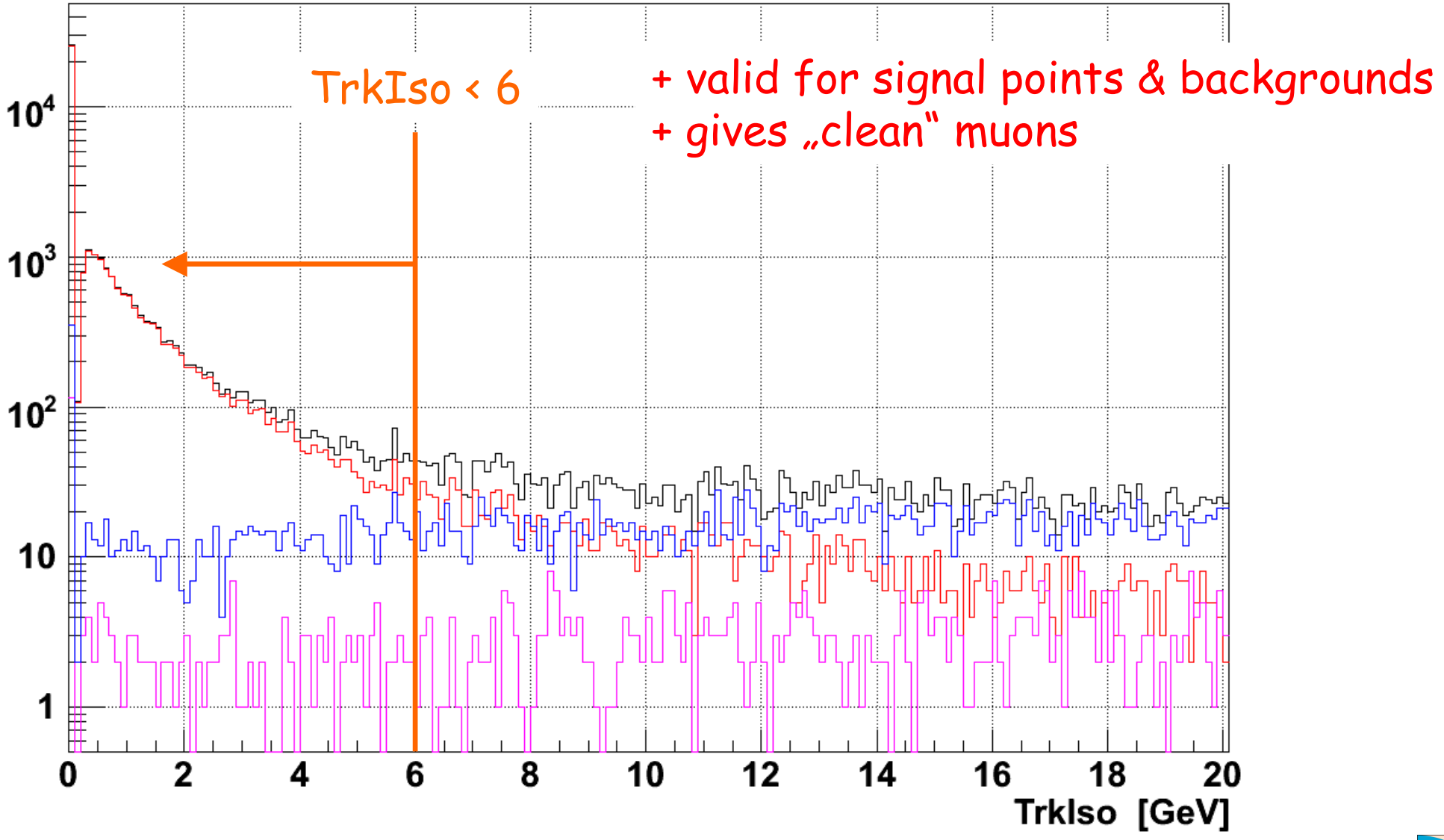
- ✓ •$|\eta| < 2.1$, single muon triggered analyses
  - ~~$|\eta| < 2.4$, additional muons in multimuon analyses (or non-muon triggered analyses)~~
- •**Muon ID** as recommended by Muon POG in AN-2008/098
  - ✓ `GlobalMuonPromptTight` (normalised $\chi^2 < 10$)
  - ✓ $|d_0| < 2$ mm (intentionally loose to keep μ's from b's)
    - ~~Tighter cut, $|d_0|/\sigma_{|d_0|} < 3$ if only want prompt μ's~~
  - ✓ nHits ≥ 11 (no plot, similar to nhits >= 12)
- •**Combined Relative Isolation**
  - A*TrkIso + B*EcalIso + C*HcalIso, use A=B=C=1
  - Compute from IsoDeposits produced during standard Muon reconstruction sequence (available in RECO,AOD,PAT)
    - cone of 0.3
  - Use $\sum p_T/p_T < x$ functional form
  - Cut value, x, TBD by analysis
  - Check energy contained in veto cone is consistent w/ that of MIP (when available)

No cut value given -> up to us

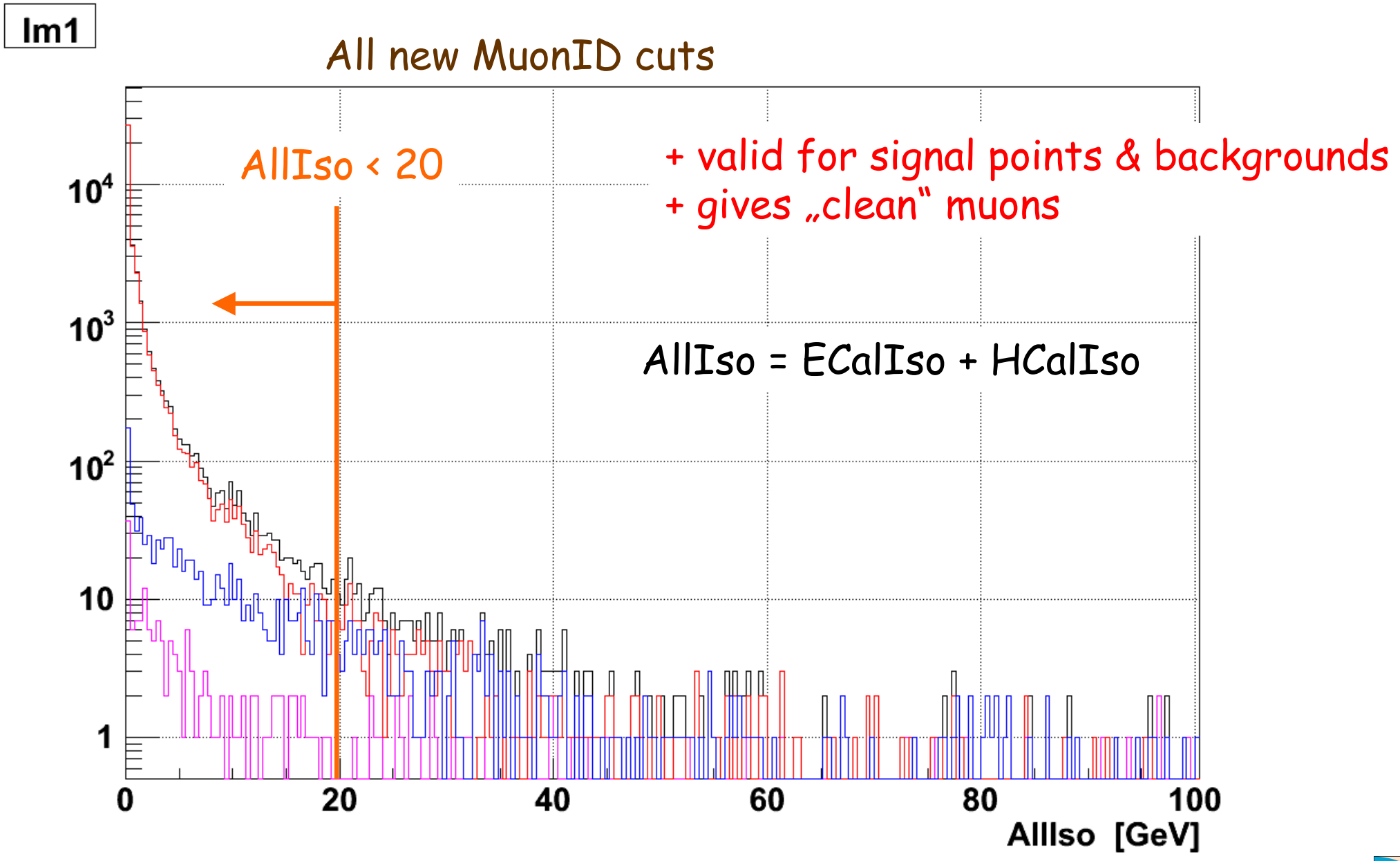
Track Isolation

lm1

All new MuonID cuts

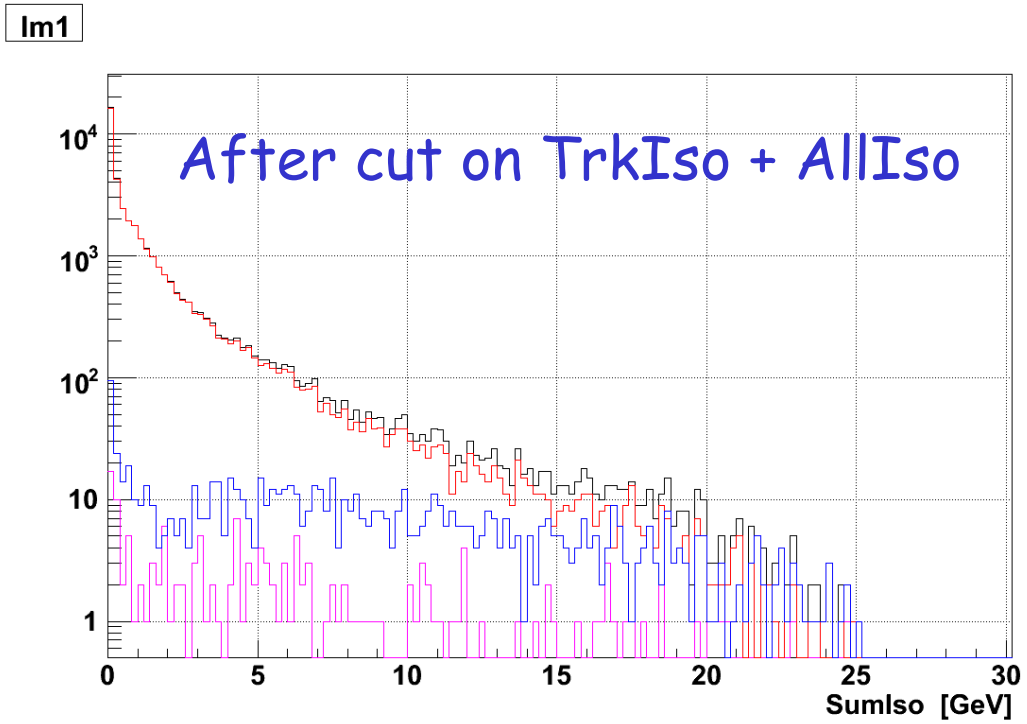


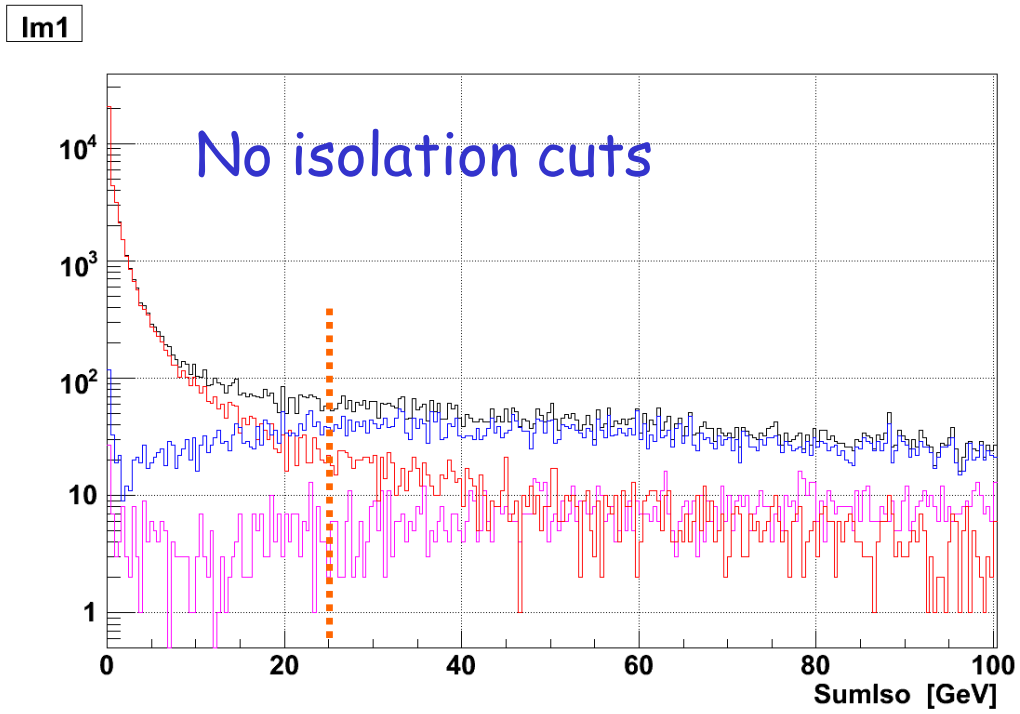
ECal + HCal Isolation



Combined Isolation

SumIso = TrkIso + ECalIso + HCalIso

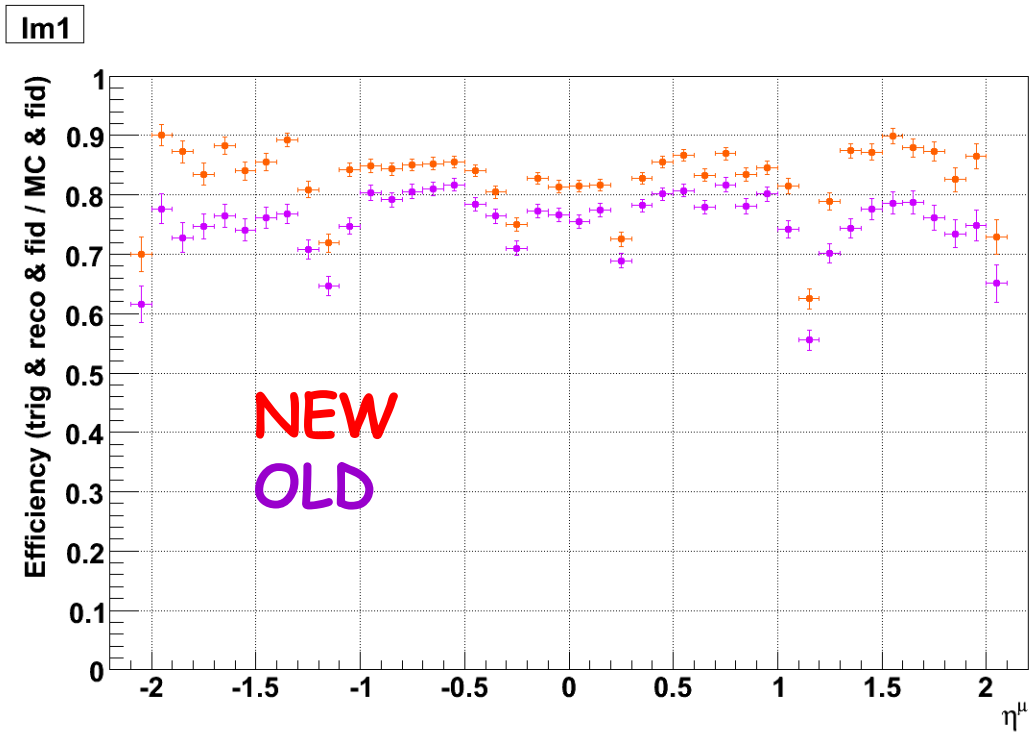


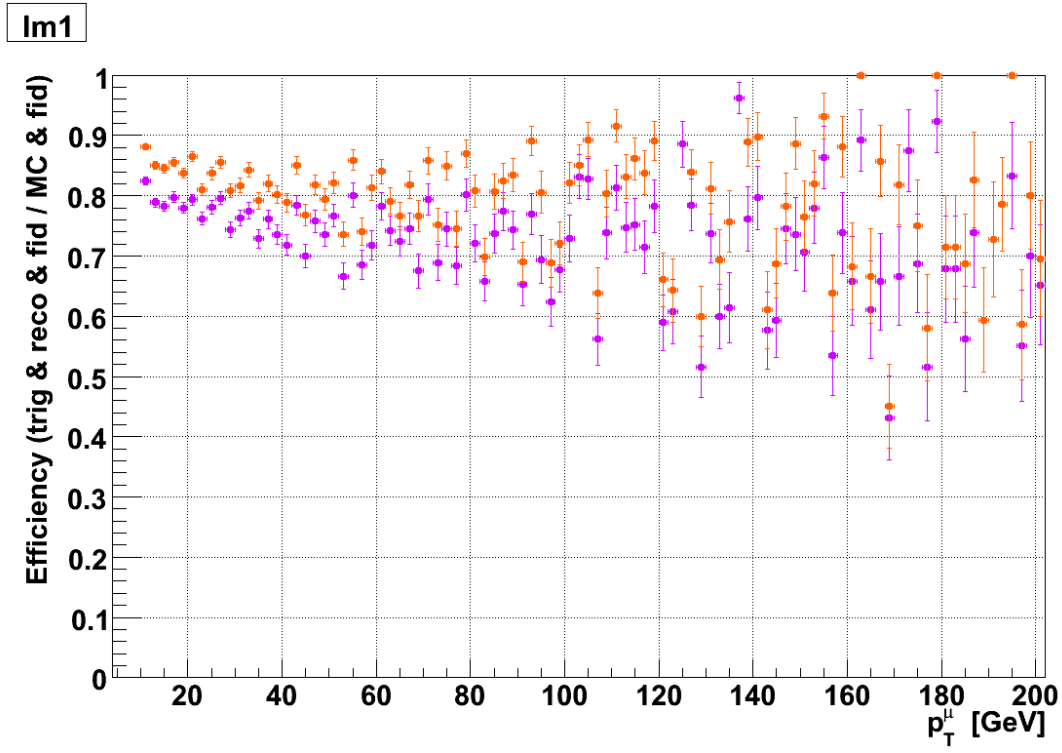


Loss of information if cutting only on total sum instead of using two independent cuts

-> would prefer Trk + Cal isolation independently

Efficiency





Gain mainly due to reduced χ^2/ndof cut
- 5% in central region
- 10% in more forward region

Baseline MuonID - Summary

Proposed Baseline Muon Selection

C. Hill, V+jets Meeting
23. Jan. 2009

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  - ✓ nHits ≥ 11
- **Combined Relative Isolation**
  - (✓) A*TrkIso + B*EcalIso + C*HcalIso, use A=B=C=1
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    - cone of 0.3
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  - Cut value, x, TBD by analysis
  - Check energy contained in veto cone is consistent w/ that of MIP (when available)

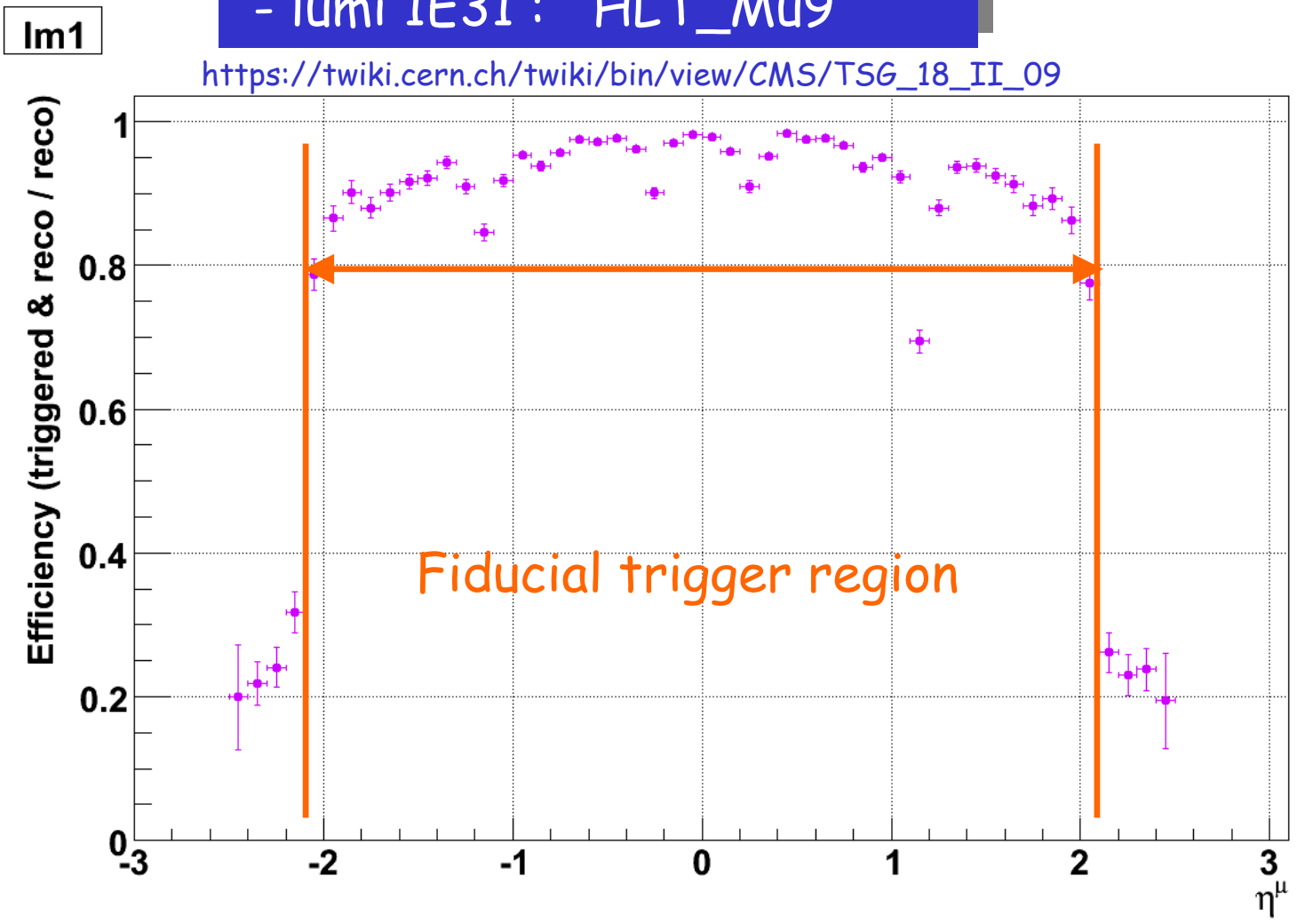
TrkIso < 6 & AllIso < 20

We are investigating also independent cuts on **ECal** & **HCal**

Trigger Efficiency (I)

Lowest unprescaled triggers :
- lumi 8E29 : HLT_Mu3
- lumi 1E31 : HLT_Mu9

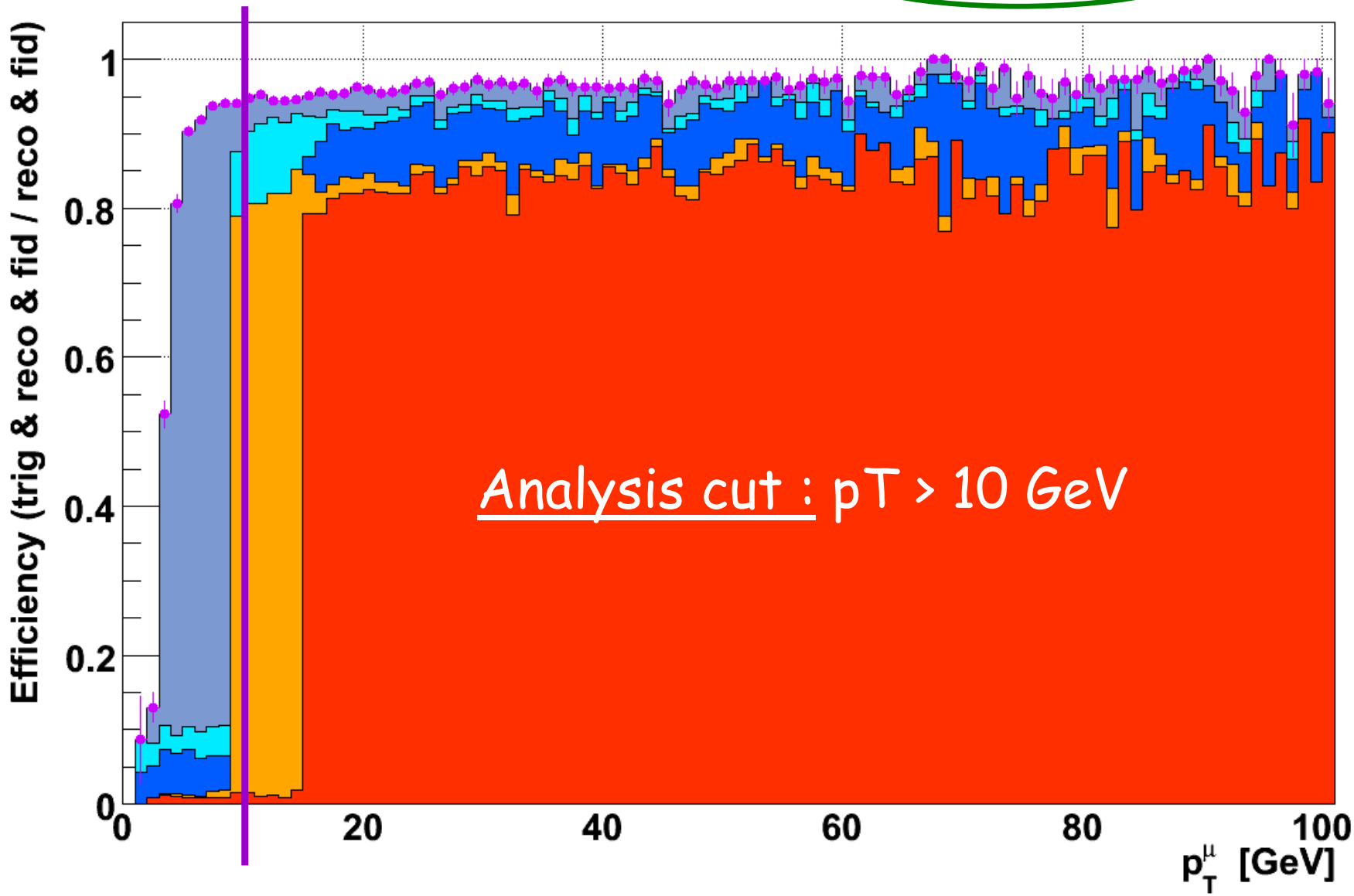
https://twiki.cern.ch/twiki/bin/view/CMS/TSG_18_II_09



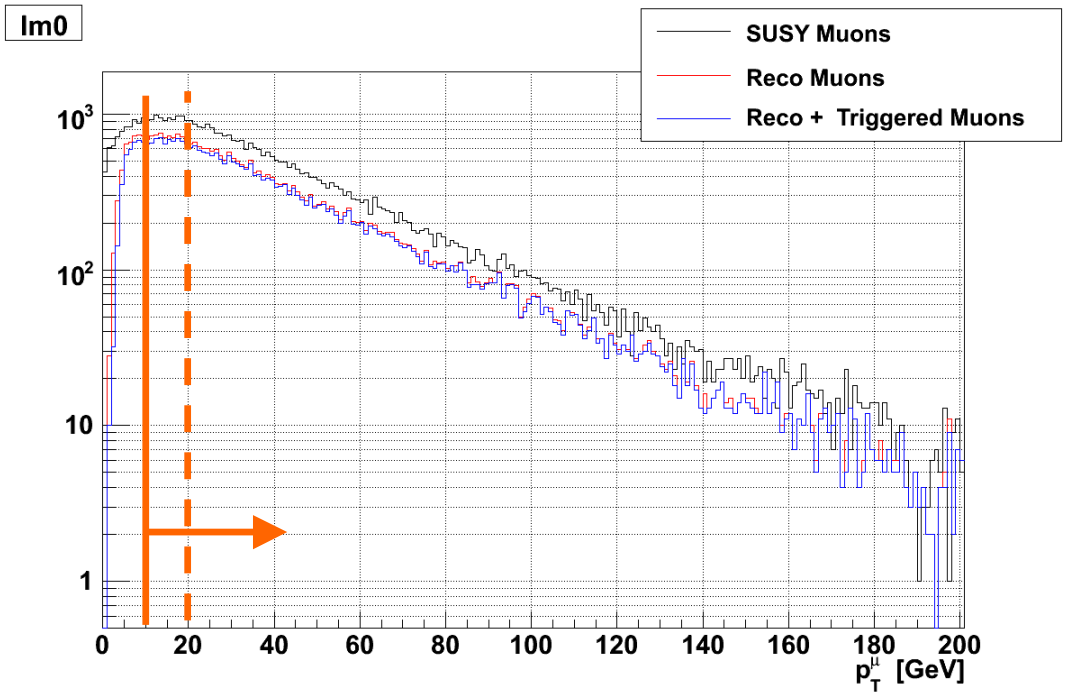
Trigger Efficiency (II)

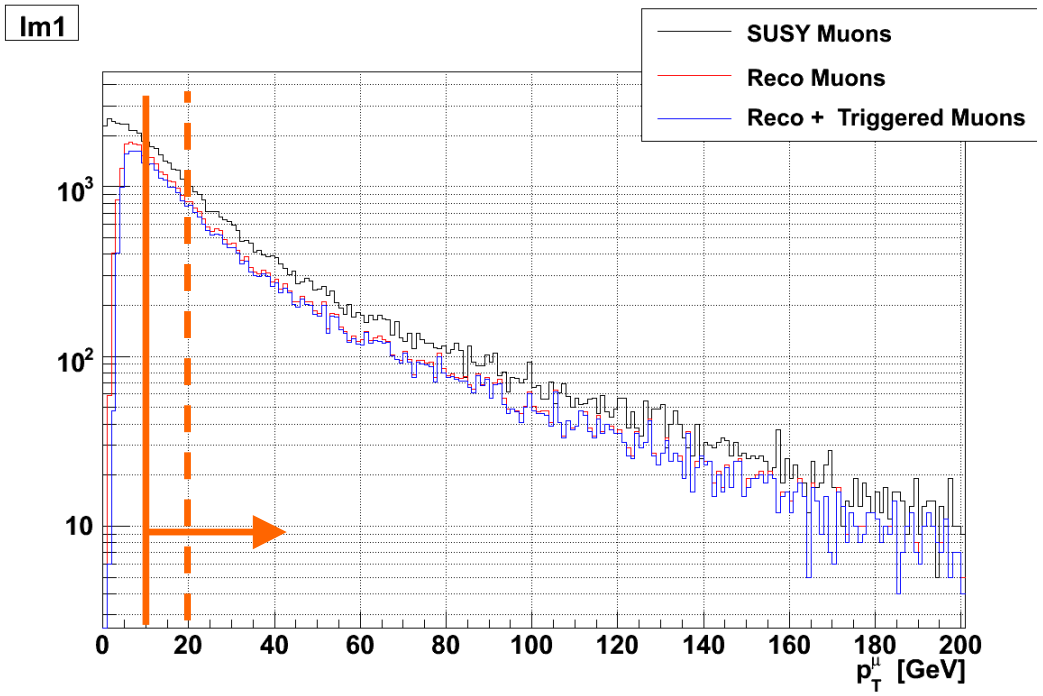
unprescaled

lm1 HLT_IsoMu15 HLT_IsoMu9 HLT_Mu15 HLT_Mu9 HLT_Mu3 HLT_MU_OR



SUSY Spectrum : Muons



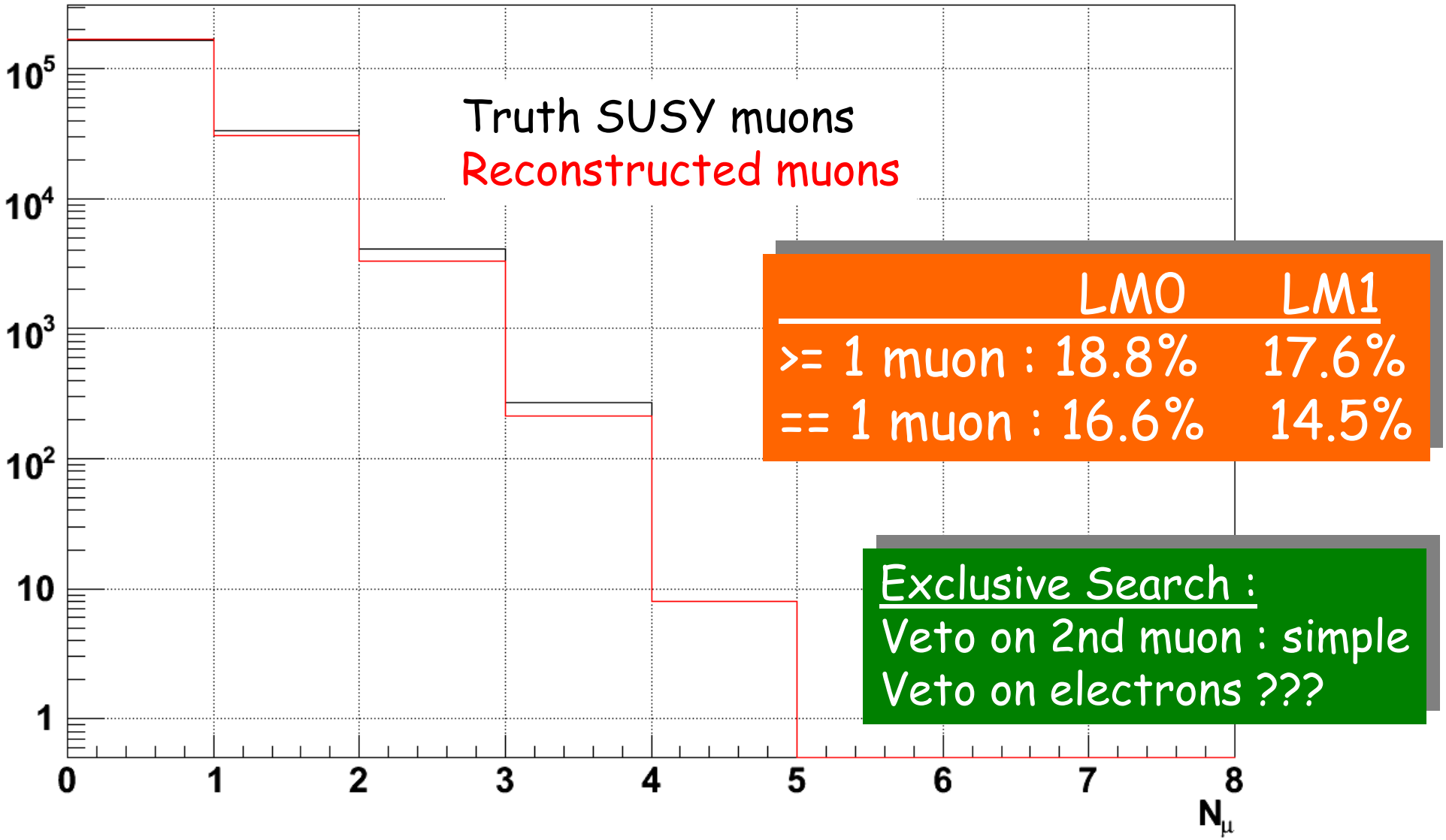


SUSY signal muons have rather low p_T
-> reduce the muon p_T cut to increase acceptance
-> low trigger thresholds make this possible !

Other Issues : LM0, incl. <-> excl.

lm0

We included LM0



	LM0	LM1
>= 1 muon :	18.8%	17.6%
== 1 muon :	16.6%	14.5%

Exclusive Search :
Veto on 2nd muon : simple
Veto on electrons ???

Summary

- MuonID & Trigger studies nearly finished
- switch to new MuonID, relax pT cut
- focus now on data-driven background estimation