

RA4 Muon Study

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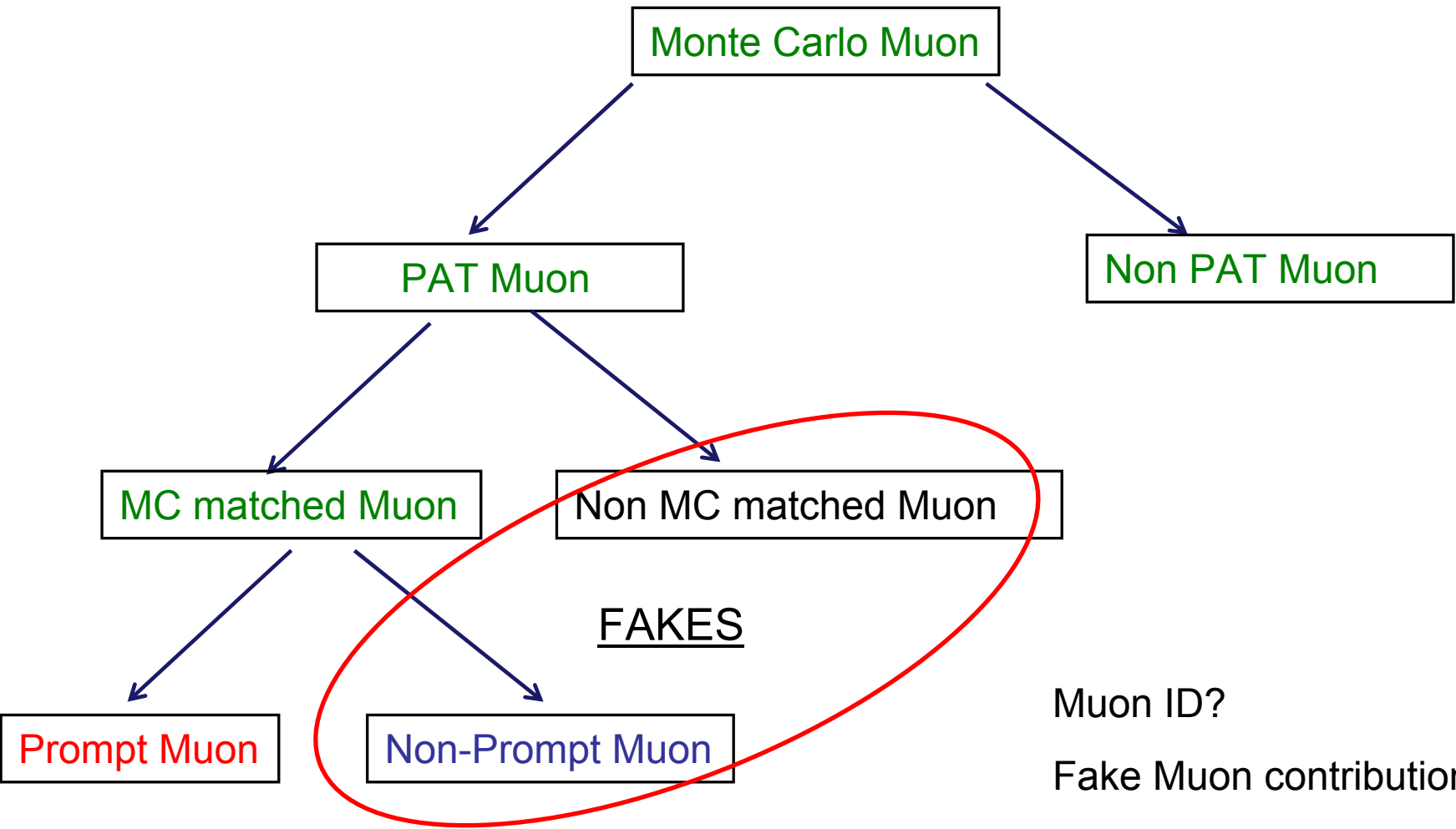
Weekly Budapest-Debrecen-CERN meeting

Supported by NKTH and OTKA (NK67974, 74153, H07-C 74281)

07/09/2009

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Muon ID?
 Fake Muon contribution?
 Efficiency?

RA4 Muon selection (baseline cuts)

Quantity	PAT Object and Member Function	Cut	Comment
Mu type	pat::Muon => isGood("GlobalMuonPromptTight")	GlobalMuonPromptTight	Chi ² <10
p _T	pat::Muon => pt()	≥ 20 GeV	
abs(eta)	pat::Muon => eta()	≤ 2.1	
Rel. Isolation	pat::Muon => hcallIso(), ecallIso(), trackIso(), pt()	< 0.1	
chi ² /dof	pat::Muon => combinedMuon()->chi2(), combinedMuon() ->ndof()	< 10	
abs(d ₀)	pat::Muon => track()->d0 *	< 0.2 cm	
N hits	pat::Muon => track()->numvalhits()	≥ 11	
HCal Iso Deposit E	pat::Muon => hcallIsoDeposit->candEnergy()	< 6	
ECal Iso Deposit E	pat::Muon => ecallIsoDeposit->candEnergy()	< 4	

Requirement	Comment
Global normalized- $\chi^2 < 10$	Watch out for long tails in real data
$ d_0 < 2$ mm	From beamspot; could be tighter; careful about b-quarks
$N_{hits} \geq 11$	Could be made as function of η
Reject fits ending in 1st barrel station	Watch out for low p_T
Reject fits ending in 1st endcap station	Must wait for fix in CMSSW 2.2.0

Table 1: Summary of baseline global muon requirements. Only the first requirement is implemented in GlobalMuonPromptTight.

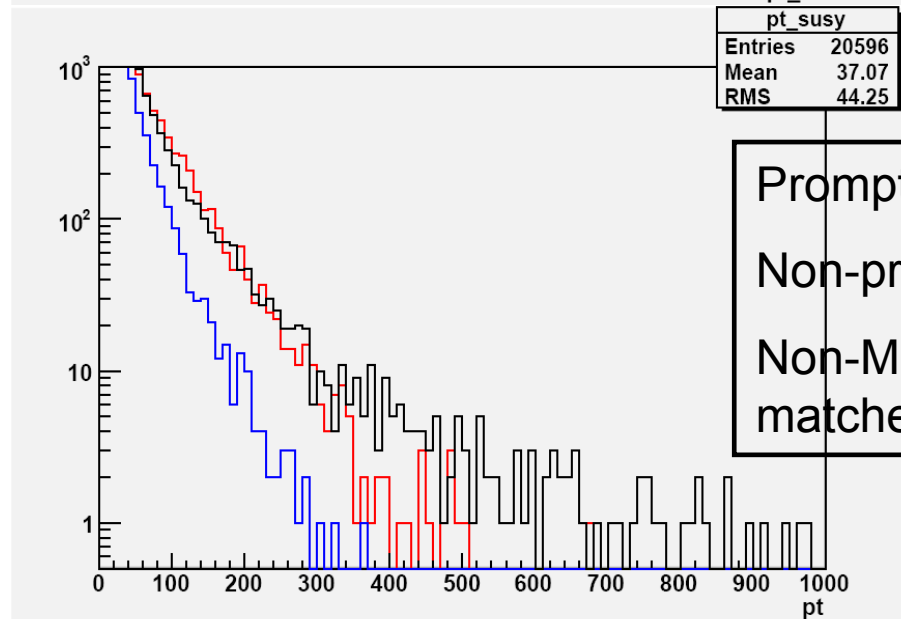
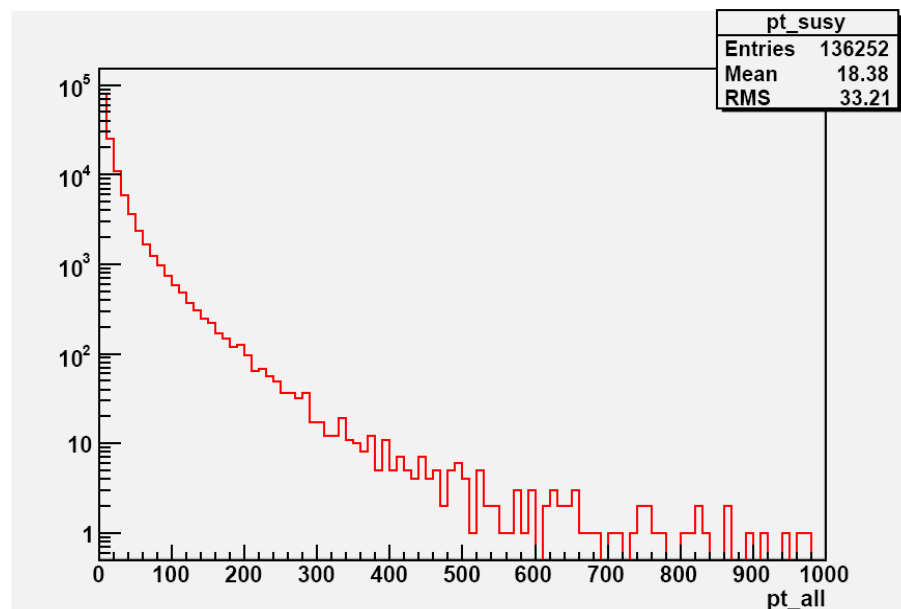
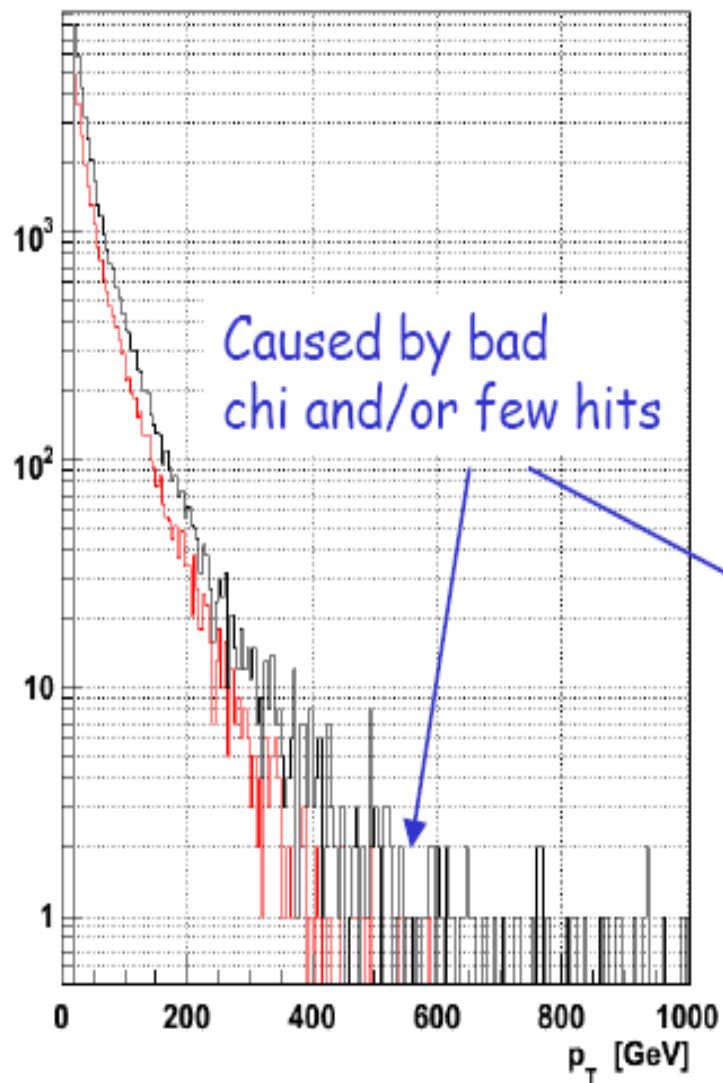
More detailed in: https://twiki.cern.ch/twiki/bin/view/CMS/SusyRA4SingleMuonProjectTable#Muon_Selection

Quantity	PAT Object and Member Function	Cut	Comment
Mu type	pat::Muon => isGood("GlobalMuonPromptTight")	GlobalMuonPromptTight	OK
p_T	pat::Muon => pt()	≥ 20 GeV > 10 GeV	
abs(eta)	pat::Muon => eta()	≤ 2.1	OK
Rel. Isolation	pat::Muon => caloose(), ecaloose(), trackloose(), pt()	< 0.1	
chi ² /dof	pat::Muon => combinedMuon()->chi2(), combinedMuon()->ndof()	< 10	OK
abs(d_0)	pat::Muon => track()->d0 *	< 0.2 cm	OK
N hits	pat::Muon => track()->numvalhits()	≥ 11	OK
HCal E	pat::Muon => hcalooseDeposit->sumEnergy()	< 6	
ECal E	pat::Muon => ecalooseDeposit->sumEnergy()	< 4	

TrkIso pat::Muon->trackIso() < 6 GeV
 ECalIso pat::Muon->ecalIso() < 6 GeV
 HCalIso pat::Muon->hcalIso() < 6 GeV

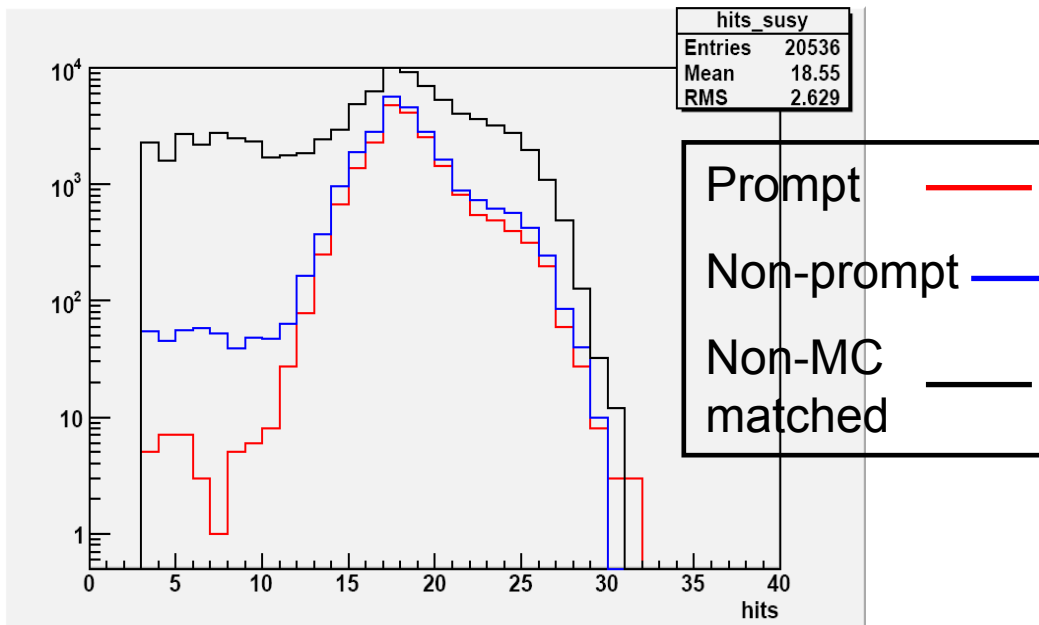
More detailed in: [Muon Id for RA4 – Follow up \(02/07/2009\)](https://twiki.cern.ch/twiki/bin/view/CMS/SusyRA4SingleMuonProjectTable#Muon_Selection),
https://twiki.cern.ch/twiki/bin/view/CMS/SusyRA4SingleMuonProjectTable#Muon_Selection

Im1

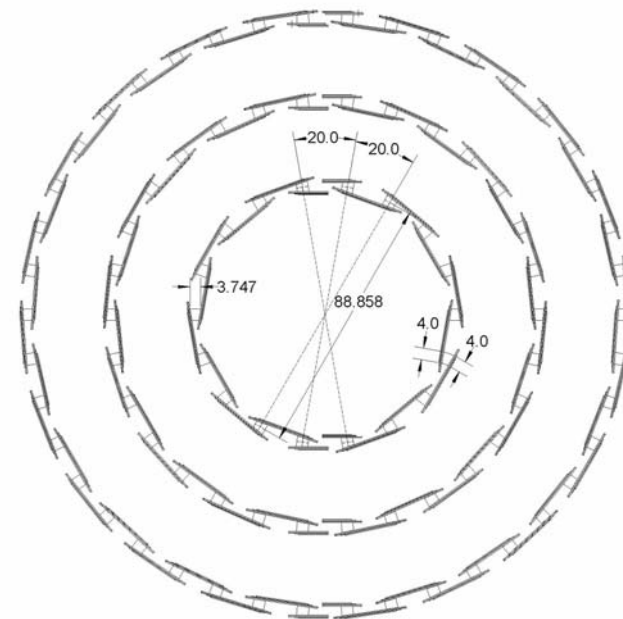


Prompt — (red line)
 Non-prompt — (blue line)
 Non-MC matched — (black line)

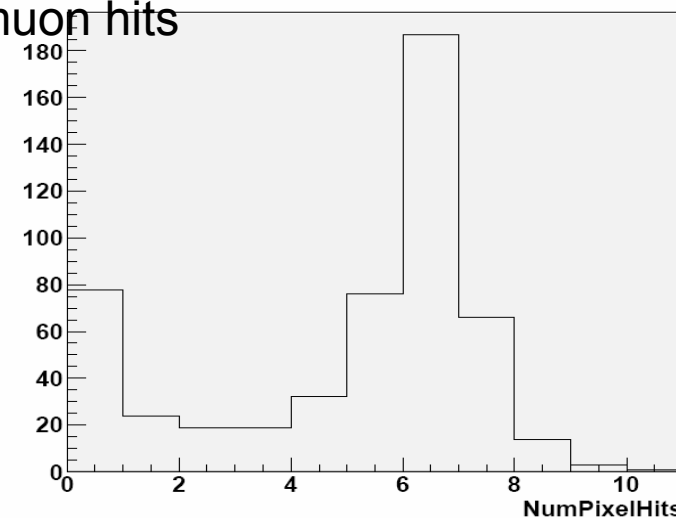
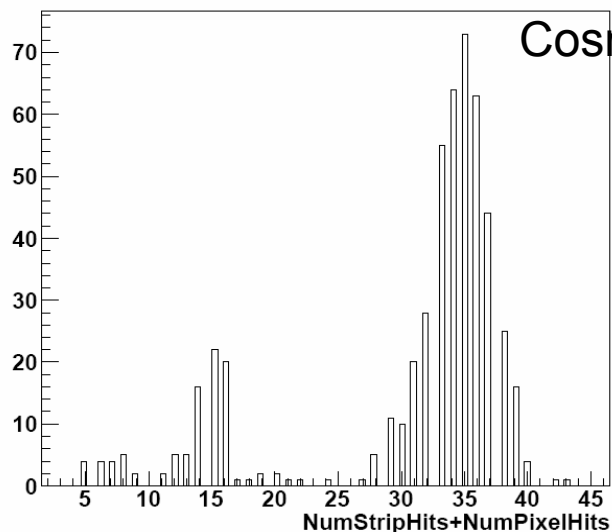


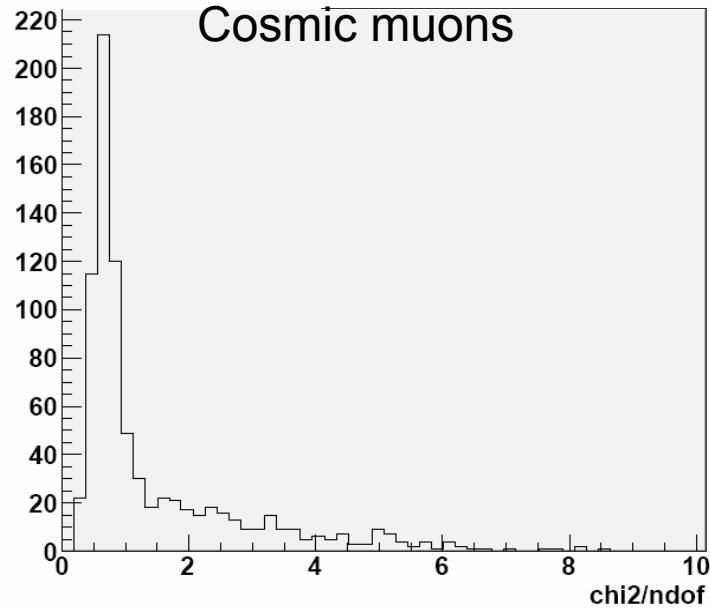
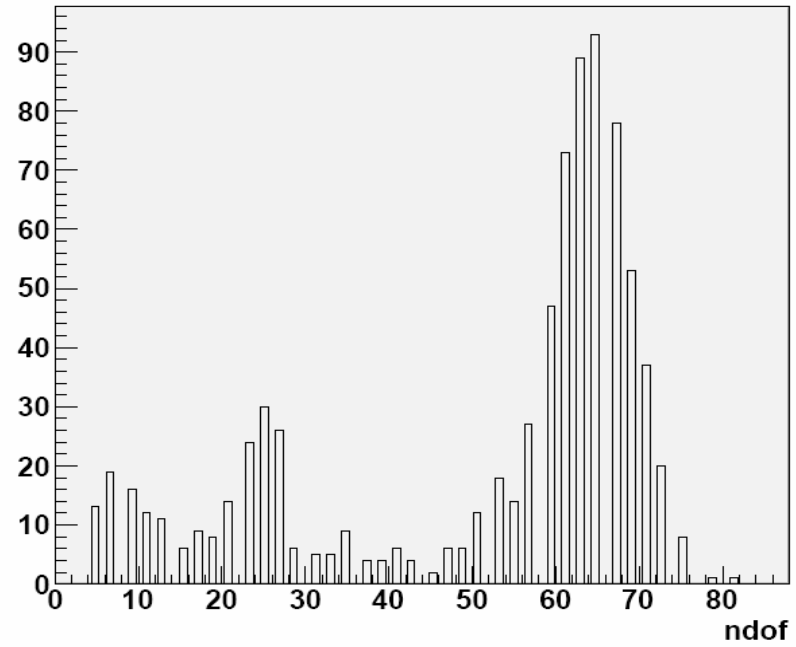
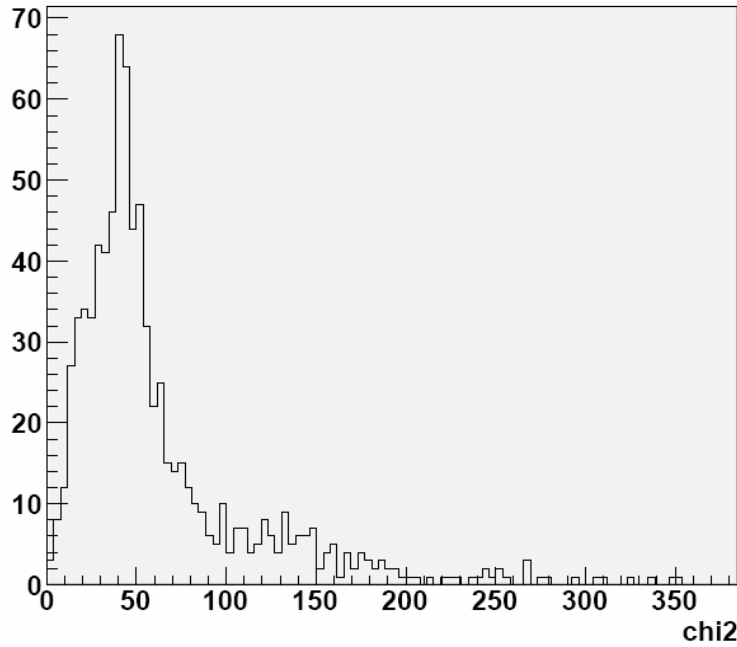


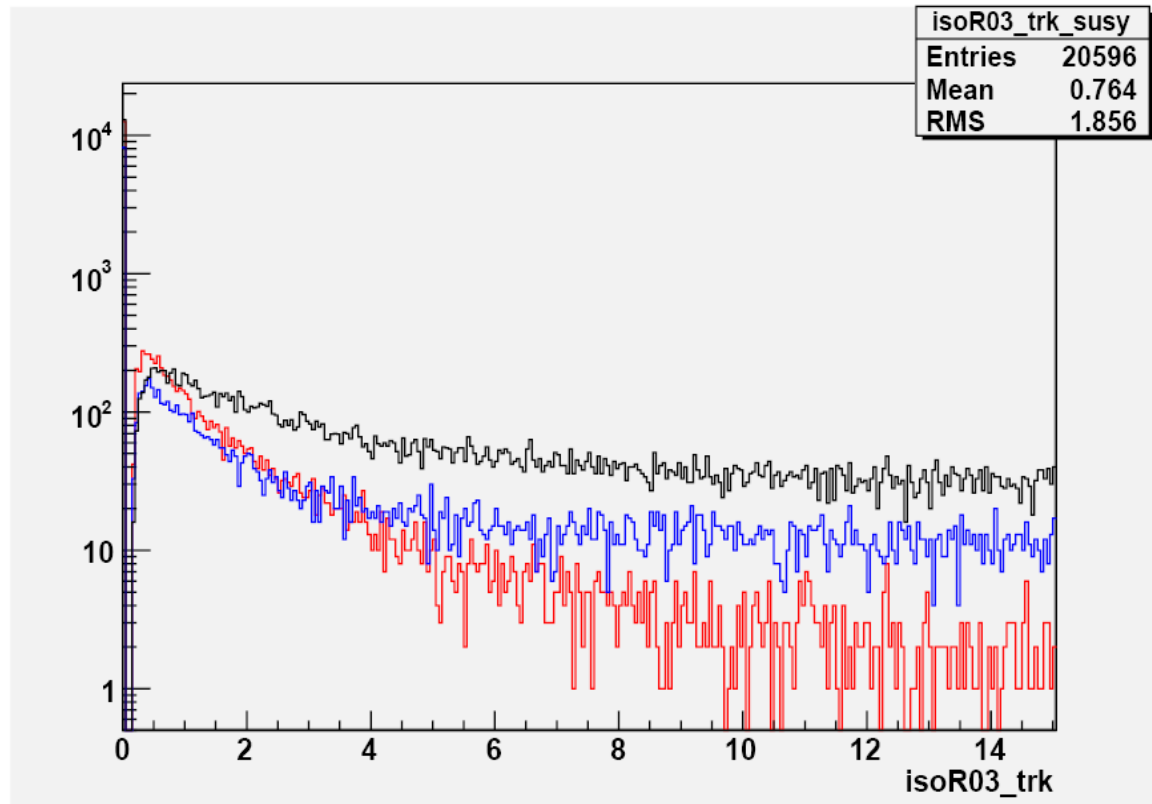
View from +Z side towards the interaction point



A muon kozel (~3 cm) haladt el a detektor kozeppontjatos, nagyjabol merolegesen (ϕ 1.5 ± 0.5 , θ 1.4 ± 0.2), min pt 5 GeV, es $\chi^2 < 2$

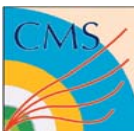


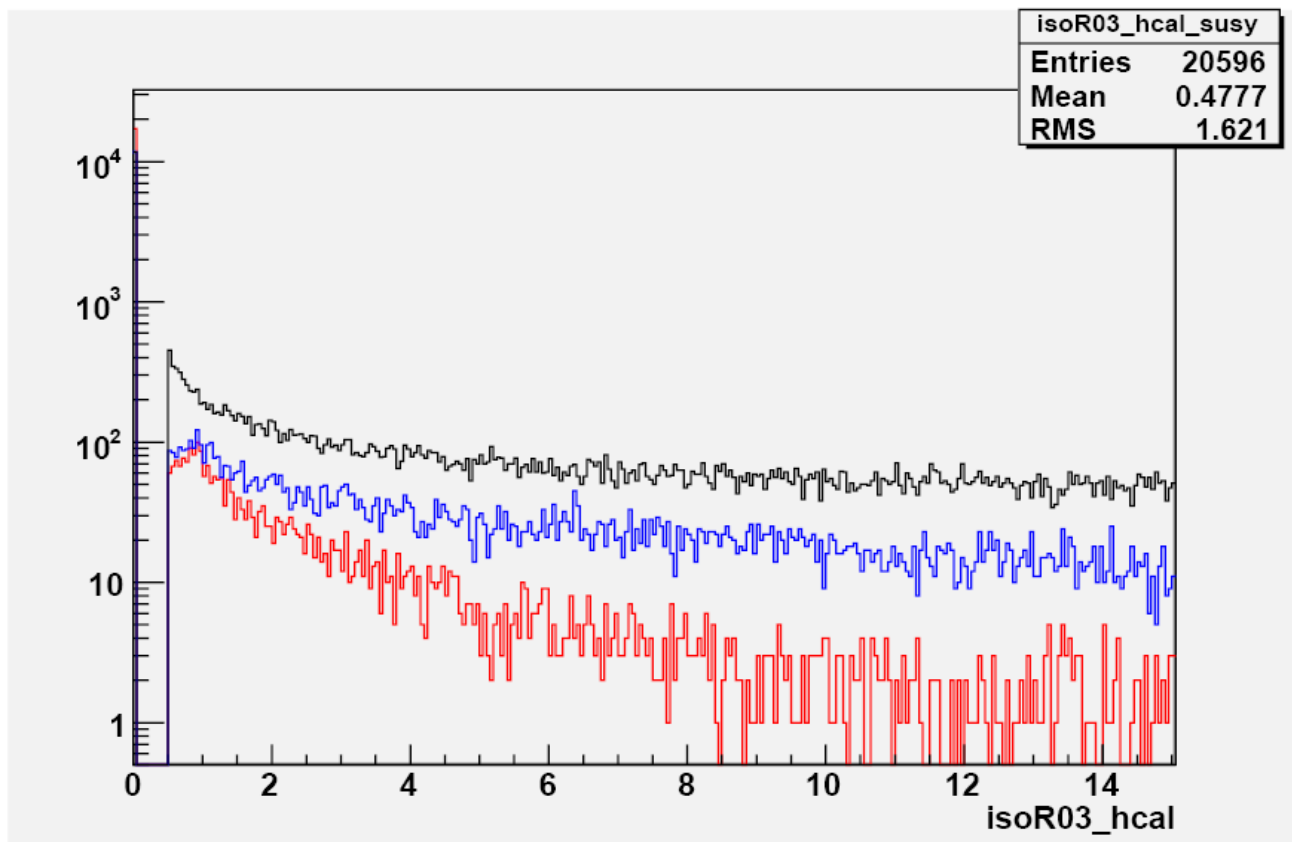




Number of events in 0:

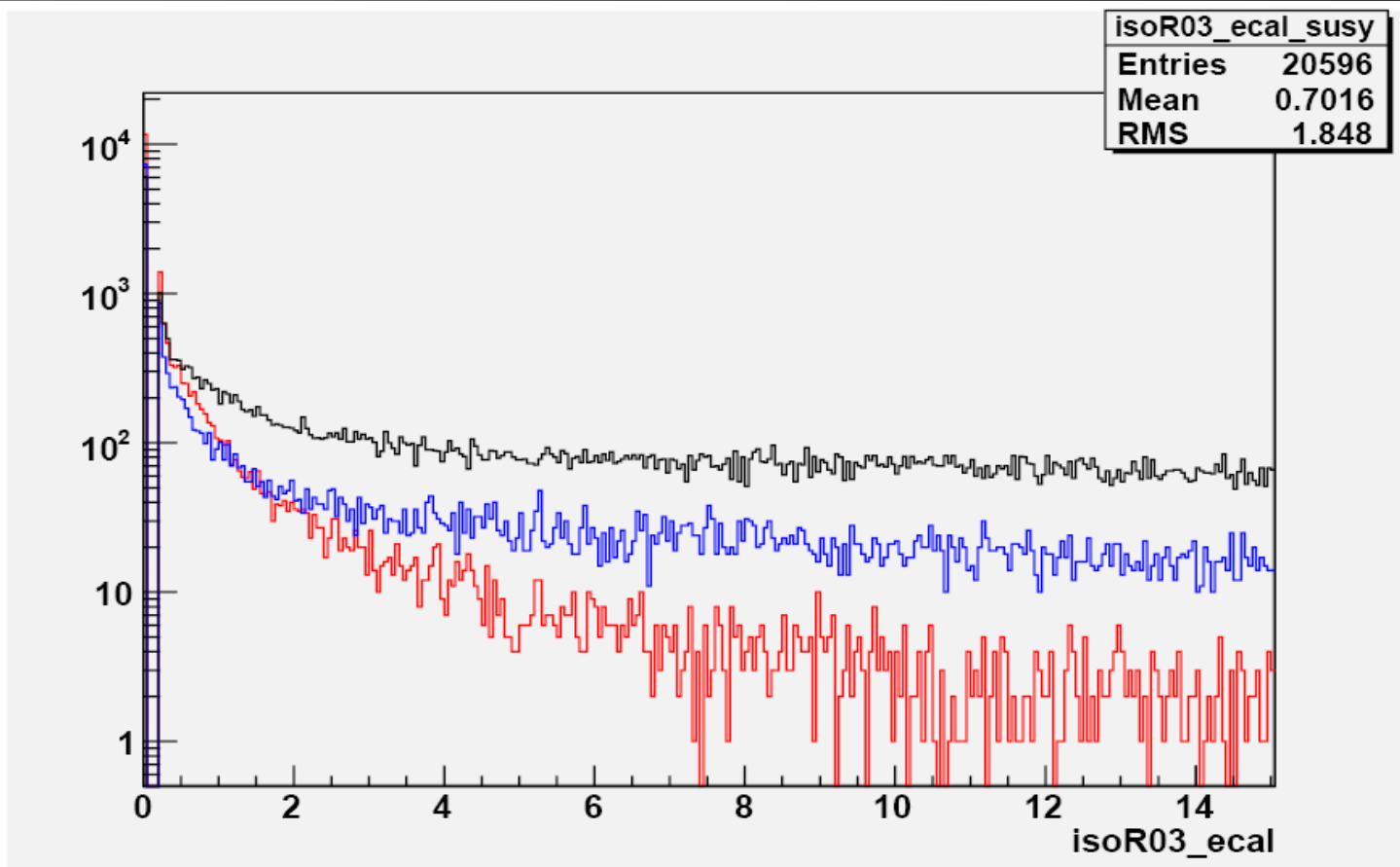
Prompt	—	12 400
Non-prompt	—	8 200
Non-MC matched	—	13 000





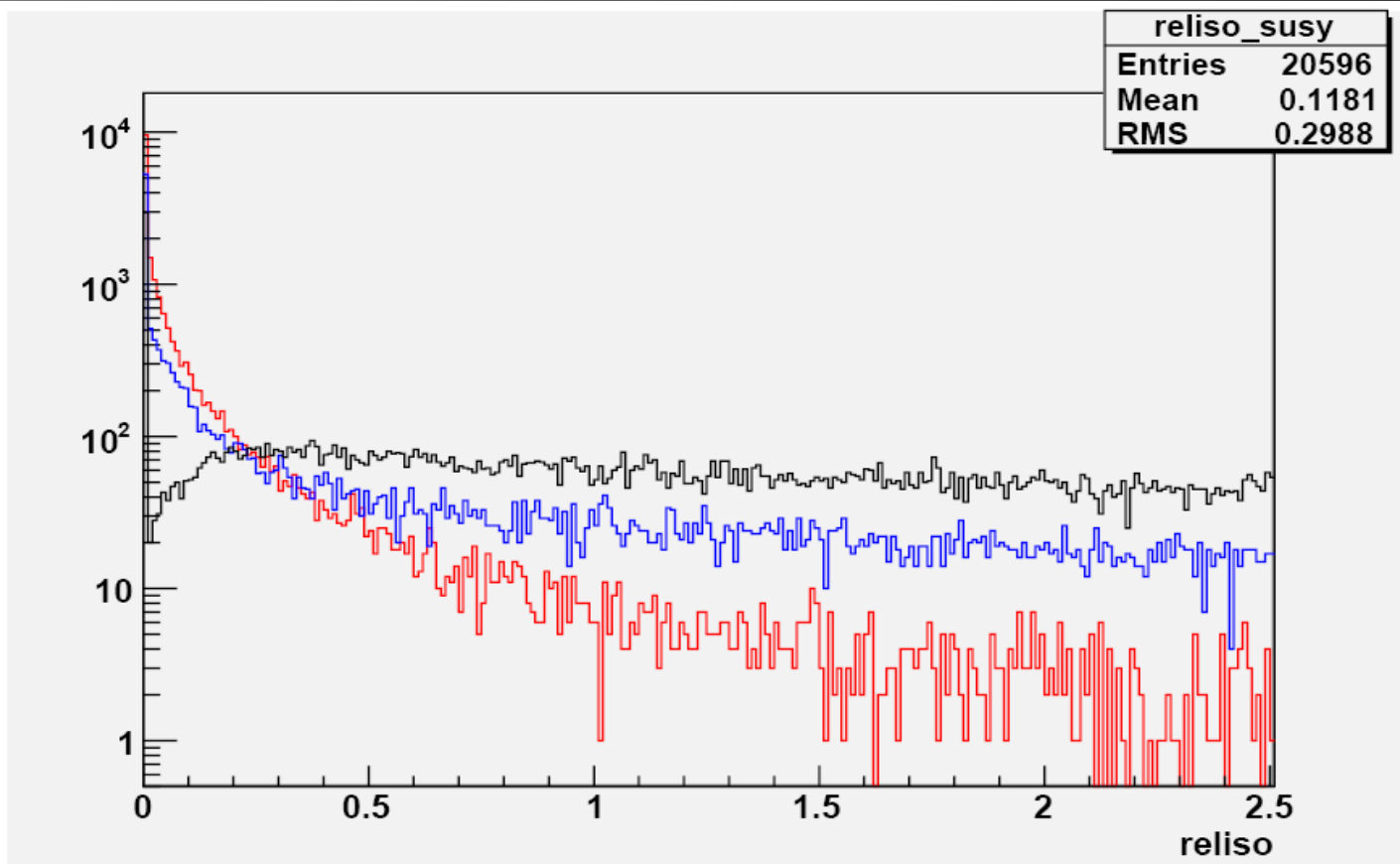
Number of events in 0:

Prompt	—	17 000
Non-prompt	—	12 000
Non-MC matched	—	12 000



Number of events in 0:

Prompt	—	11 700
Non-prompt	—	7 200
Non-MC matched	—	6 000



Number of events in 0:

Prompt	—
Non-prompt	—
Non-MC matched	—

10 000
5 200
3 000

$(\text{Tracker_iso} + \text{HCAL_iso} + \text{ECAL_iso}) / \text{pt}$