

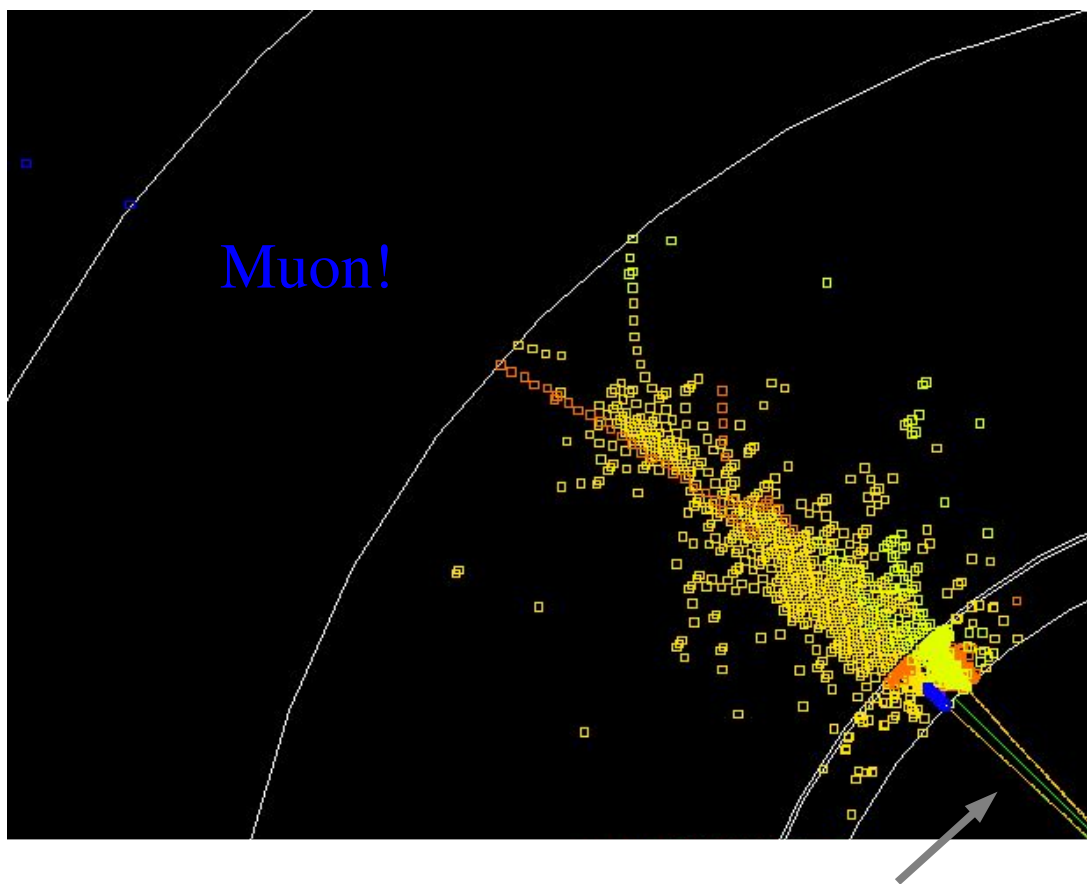
# Improving the PFA

- Special scan, study of outliers:  
distinguish non-prompt from  
prompt muons
- General study: confusion matrix

# Outliers: non-prompt muons

500 GeV qq event 456

pythia\_uds\_nobeam\_nobrem-1-500\_SLIC-v2r5p2\_geant4-v9r1p2\_LCPhys\_sid02.slcio



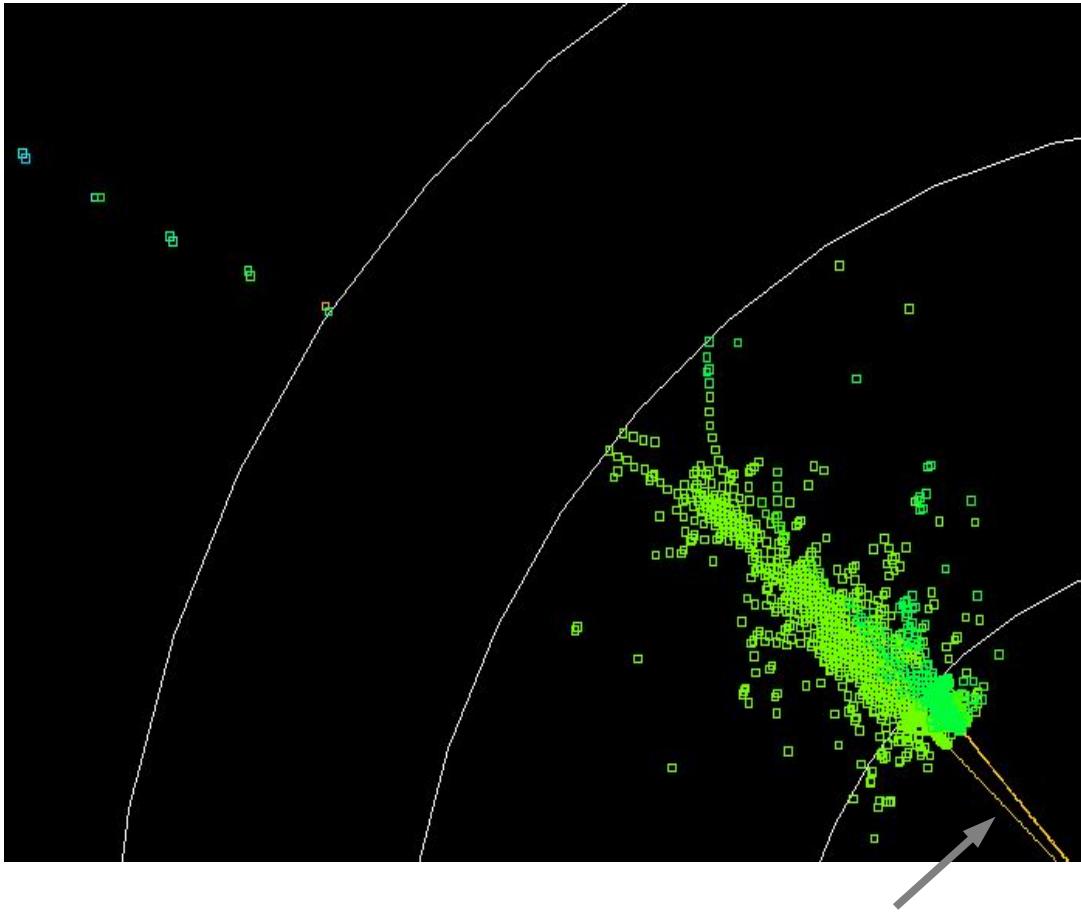
191 GeV track + 164, 2 GeV fake neutrals

- studied isolation criterion: At least 7 isolated or semi-isolated hits in HCAL
- 5 of the top 10 outliers are of this kind and cured

# Outliers: non-prompt muons

500 GeV qq event 456

pythia\_uds\_nobeam\_nobrem-1-500\_SLIC-v2r5p2\_geant4-v9r1p2\_LCPhys\_sid02.slcio



No more fake neutrals

- however: very rare cases  
~ 5‰ of qqbar, ZZ, ttbar events
- changes PFA mean real
  - efficiency: 0.775→0.776
  - purity : 0.748→0.747
- resolution improved by tiny amount

# Confusion matrix

- Output from Ron's diagnostic routines shows where all of the energy is going:

<b>ZZ</b>	Truth: photon	Truth: tracked particle	Truth: neutral hadron	Sum
Reco: photon	108,368	5,979	4,247	118,594 Purity: 91.4%
Reco: tracked particle	8,679	227,475	15,539	251,693 Purity: 90.4%
Reco: neutral hadron	6,905	22,673	42,666	72,244 Purity: 59.1%
Unused	1,037	9,177	2,214	12,428
Sum	124,989 Effic: 86.7%	265,304 Effic: 85.7%	64,666 Effic: 66.0%	

Diagonal elements: correct ID

Off-diagonal elements: mis-identified energy

Charged-neutral confusion especially bad...

Mat Charles,  
April 2008

23

# Confusion matrix

- Checked compatibility diagnostic routines/PFA and updated the values:

<b>ZZ</b>	Truth: photon	Truth: tracked particle	Truth: neutral hadron	Sum
Reco: photon	22942	1034	624	24600 Purity: 93.3%
Reco: tracked particle	2410	58158	5303	65871 Purity: 88.3%
Reco: neutral hadron	1490	3975	12472	17937 Purity: 69.5%
Sum	26842 Effic: 85.5%	62133 Effic: 93.6%	17775 Effic: 70.2%	

Efficiencies and purities improved in general.

# Conclusion

- Problems with non-prompt muons fixed ad hoc
- Results of specialized studies could be used
- Diagnostic routines give a wealth of information