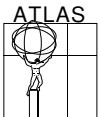
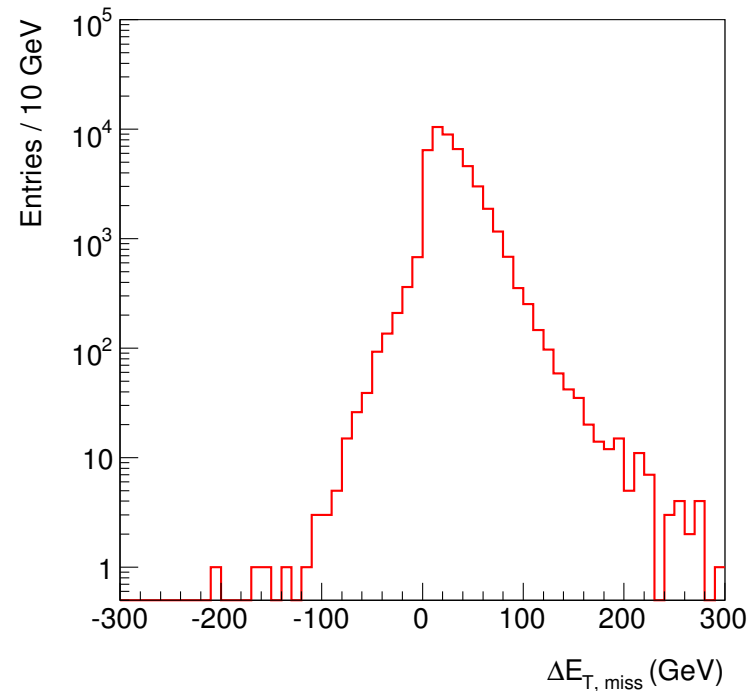
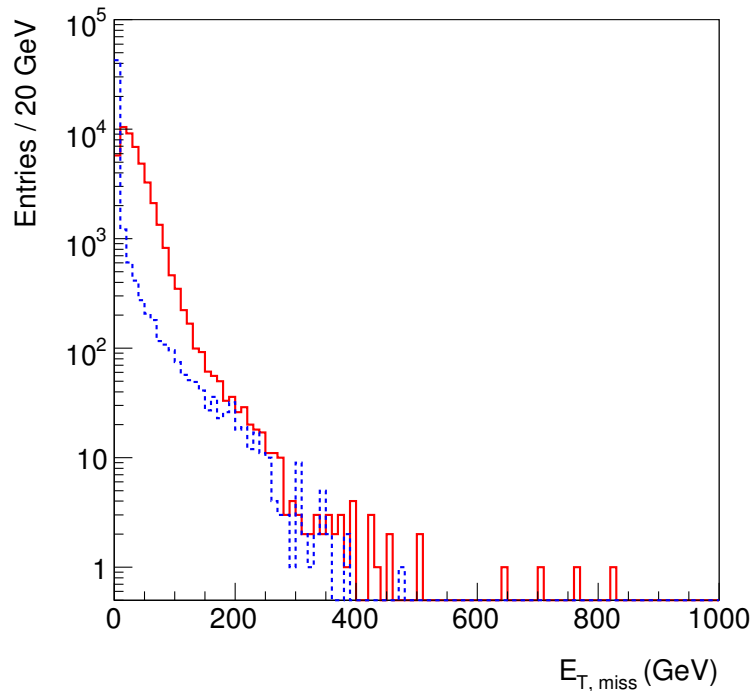


\cancel{E}_T Tails with 11.0.41

Frank Paige, BNL

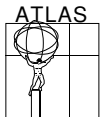
Have examined 46488 CSC11 J6_pythia_jetjet events (129pb^{-1}) reconstructed with 11.0.41. Reconstructed (solid) and Monte Carlo (dash) \cancel{E}_T (left) and difference $\Delta\cancel{E}_T = \cancel{E}_{T,\text{reco}} - \cancel{E}_{T,\text{MC}}$ (right):



Have typically $\Delta E_T \lesssim 100 \text{ GeV}$ but with long tail. Find 26/46488

J6_pythia_jetjet events with $\Delta E_T > 250 \text{ GeV}$:

Event	ΔE_T	E_T	Event	ΔE_T	E_T
102	253541	same	675	257227	same
1146	368858	same	1321	271024	same
3784	317299	507243	6515	279061	same
9184	277658	352156	14855	253218	350078
16013	760036	same	19391	261944	264038
20412	301773	456709	23003	507829	508221
23452	828827	same	23816	707013	same
25679	317695	same	30743	389279	same
33012	291657	same	35225	326488	436776
44739	252732	same	44816	277436	same
44961	1.14125e+06	same	45309	320881	same
46234	577608	643522	47097	369405	same
49004	266090	266405	49842	1.26602e+06	same

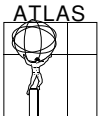


Have rerun reconstruction on 16/26 events with RDO files available at BNL. Classify as follows:

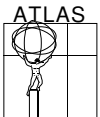
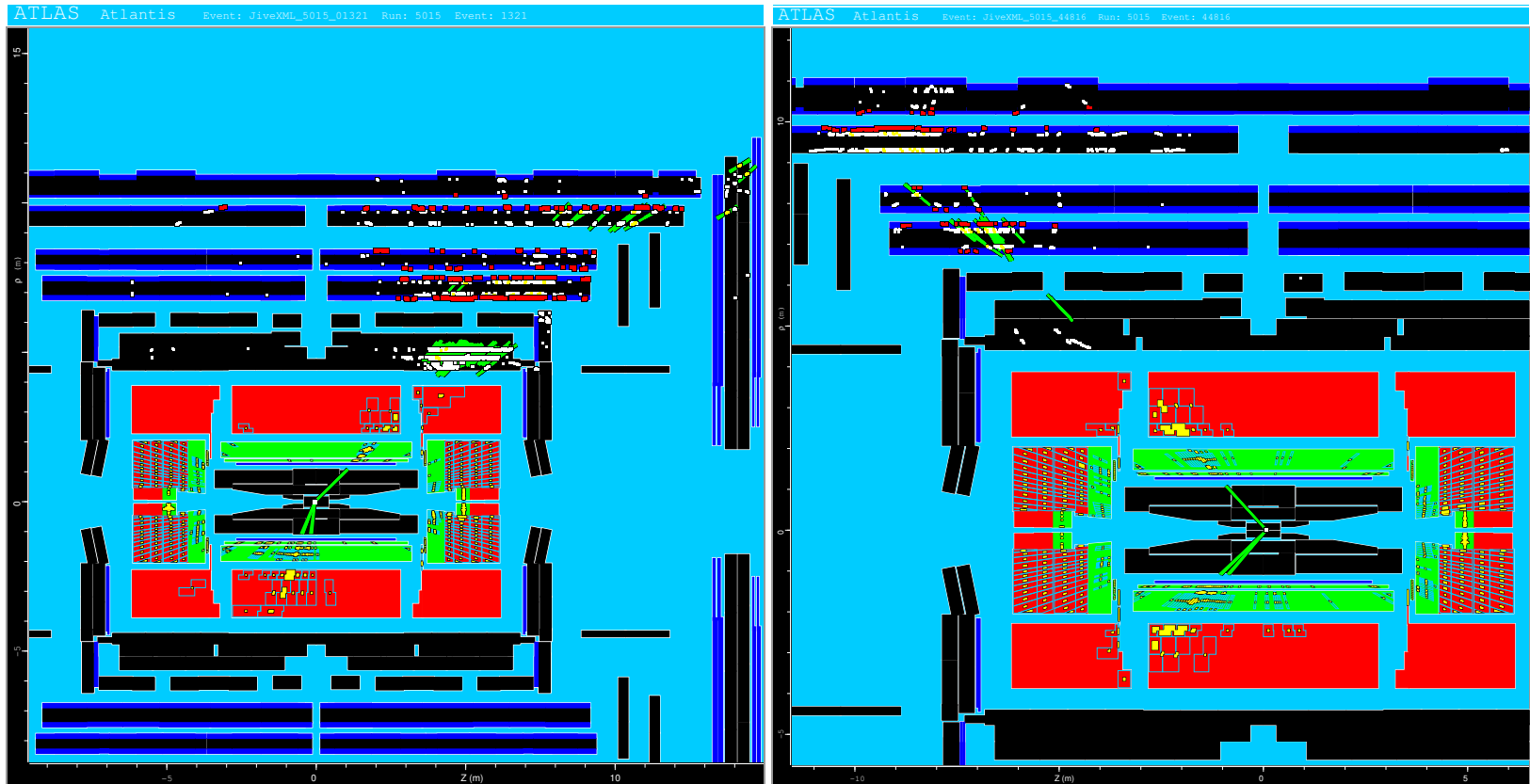
Class	Number
Jet leakage from TileBar/TileExt crack	4
Fake muons from TileBar/TileExt crack	1
Jet Leakage from TileBar/HEC crack	1
Fake muons from TileBar/HEC crack	4
Jet punchthrough	5
Other	1

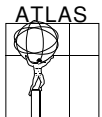
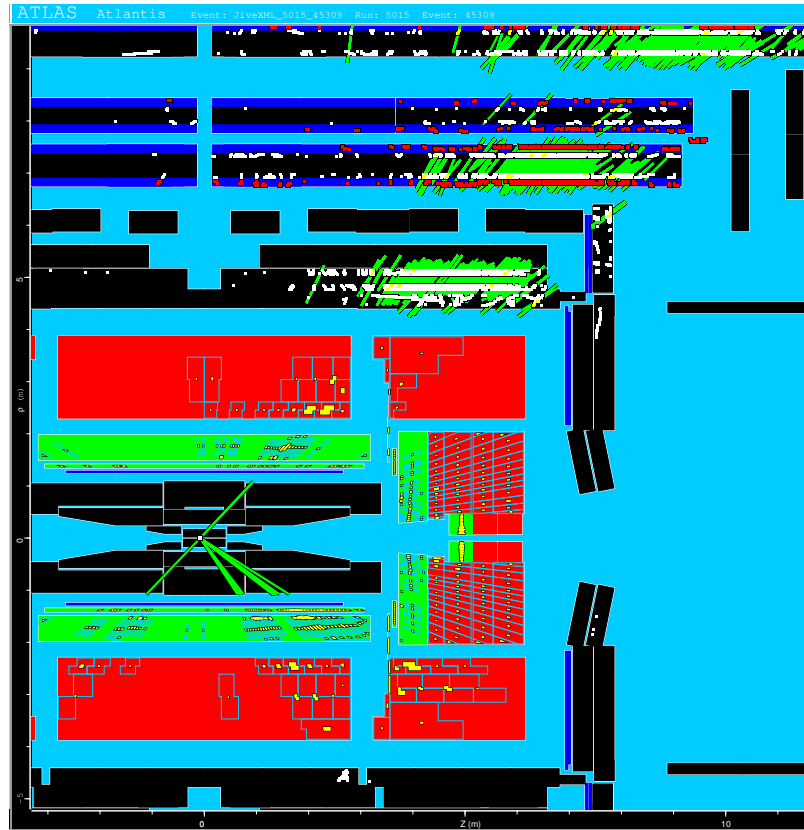
Limited statistics, but no single class dominates.

Display events with calorimeter rotated so that E_T points up. Use 10 GeV cut on tracks.

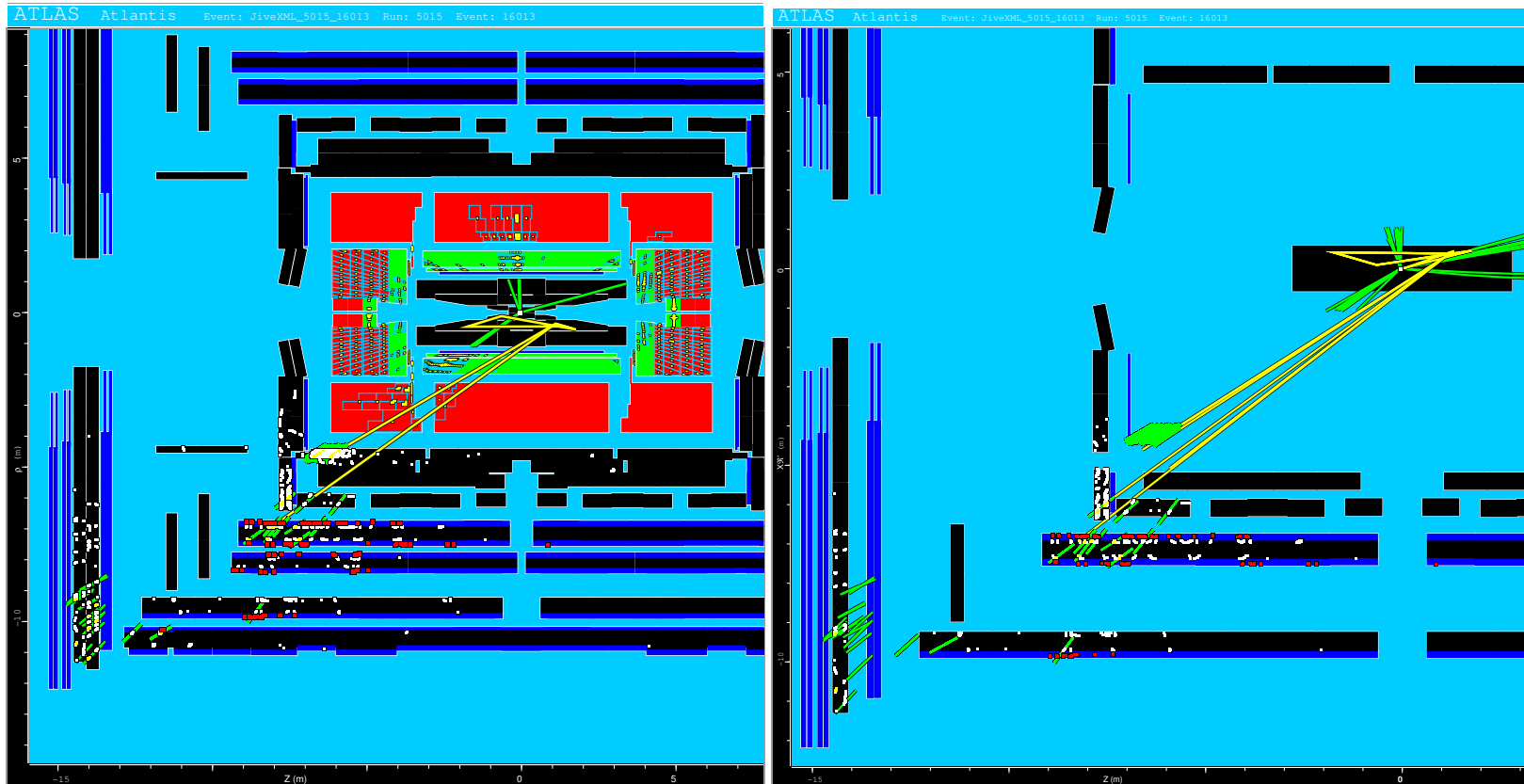


Three events with jet leakage from TileBar/TileExt crack, shower in muon system (1321, 44816, 45309):

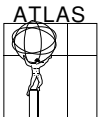




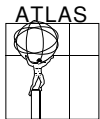
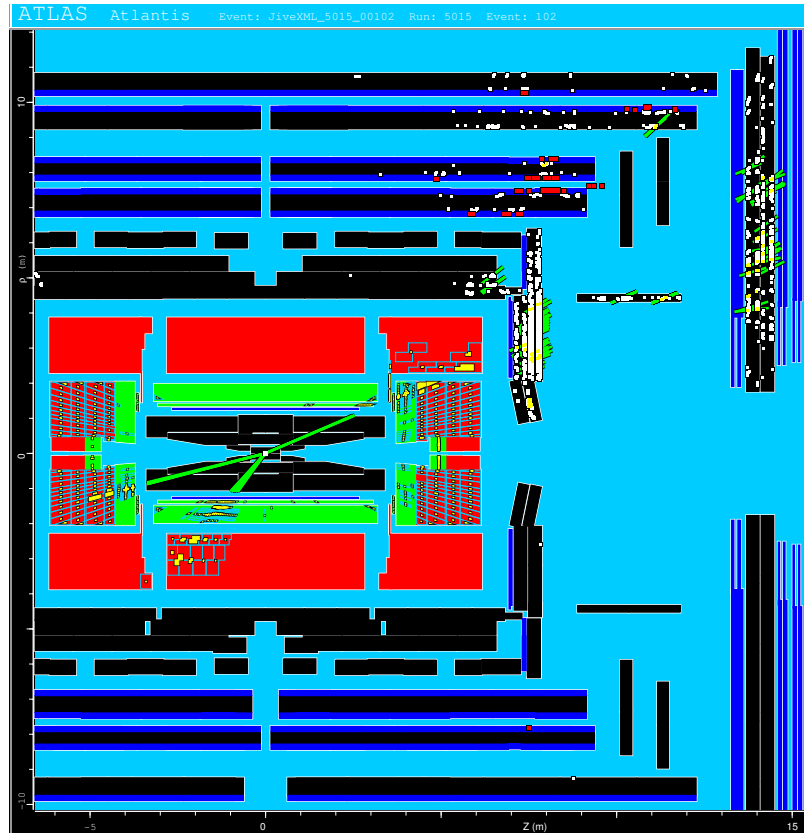
One event with shower from TileBar/TileExt crack giving fake muons.
Event 16013: $\cancel{E}_T = 760 \text{ GeV}$, two muons with 886 GeV:



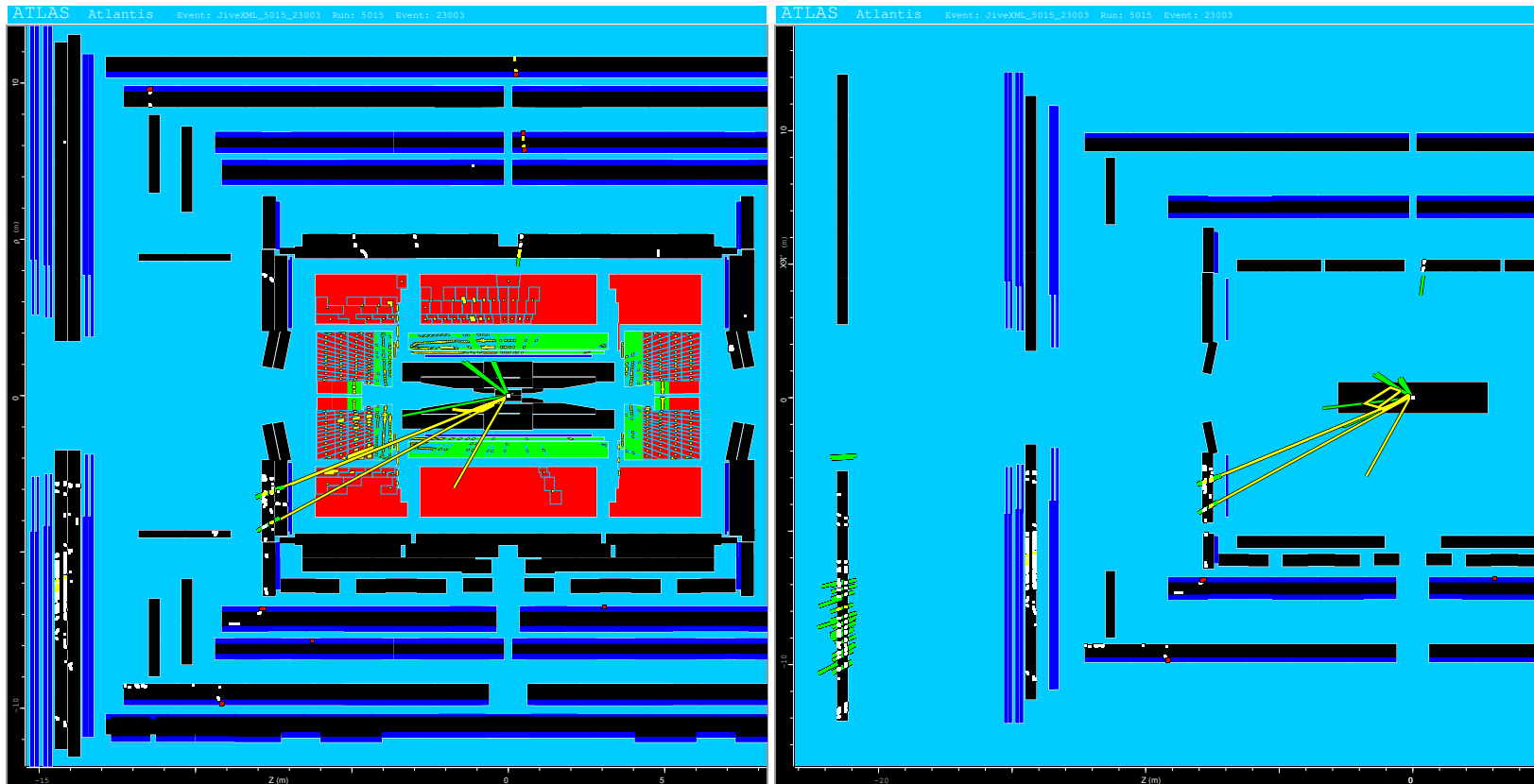
Muon with -863 GeV matches ID track with $-77 \pm 2.6 \text{ GeV}$?



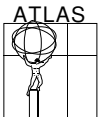
Single event with shower leakage from TileExt/HEC crack (102):



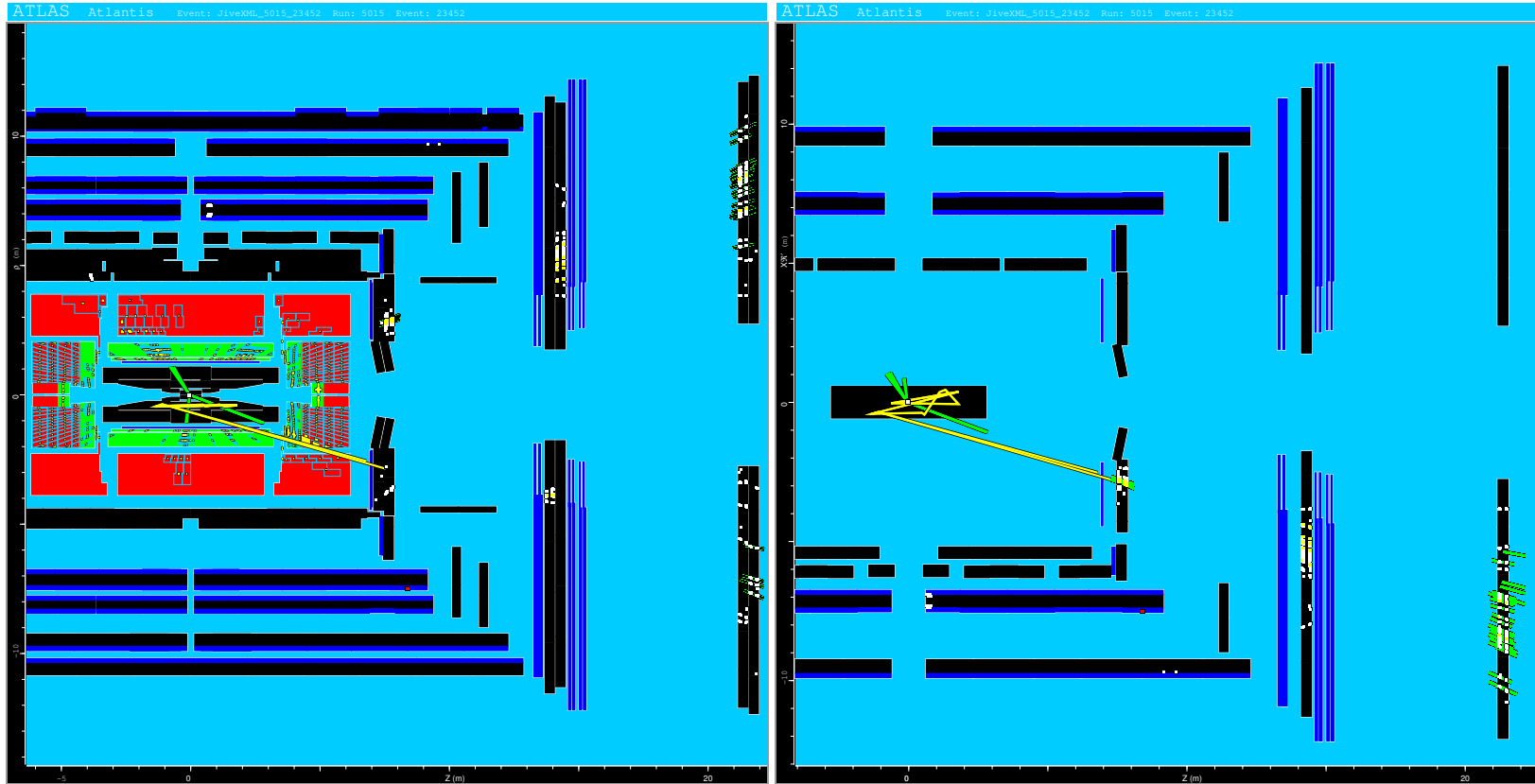
Four events with shower from TileExt/HEC crack giving fake muons:
Event 23003: $\cancel{E}_T = 508 \text{ GeV}$, three muons with 520 GeV:



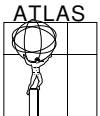
Muon with -495 GeV matches ID track with $-172 \pm 17 \text{ GeV}$?



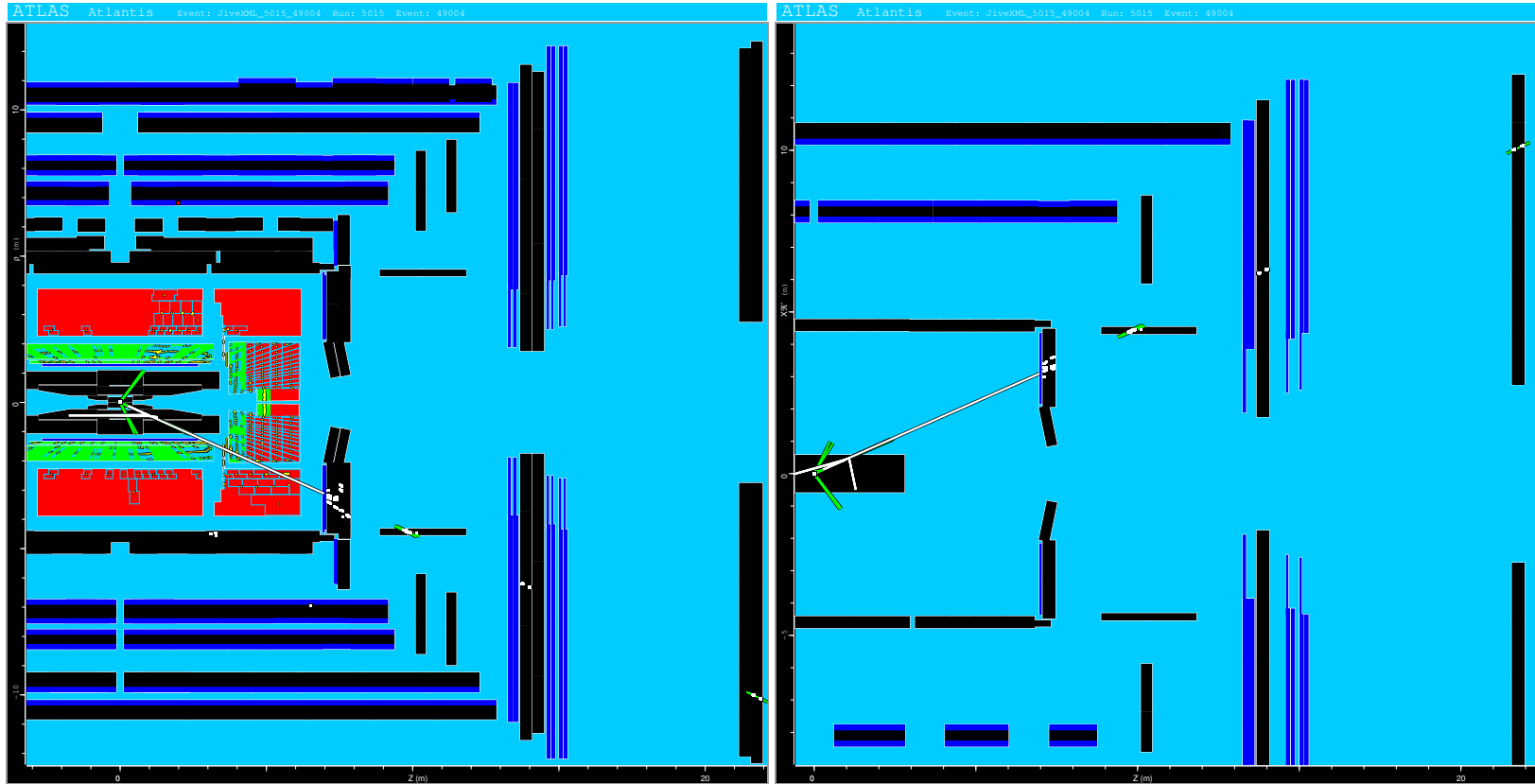
Event 23452: $E_T = 829 \text{ GeV}$, four muons with 832 GeV :



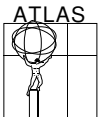
Muon with -817 GeV matches ID track with $-247 \pm 29 \text{ GeV}$?



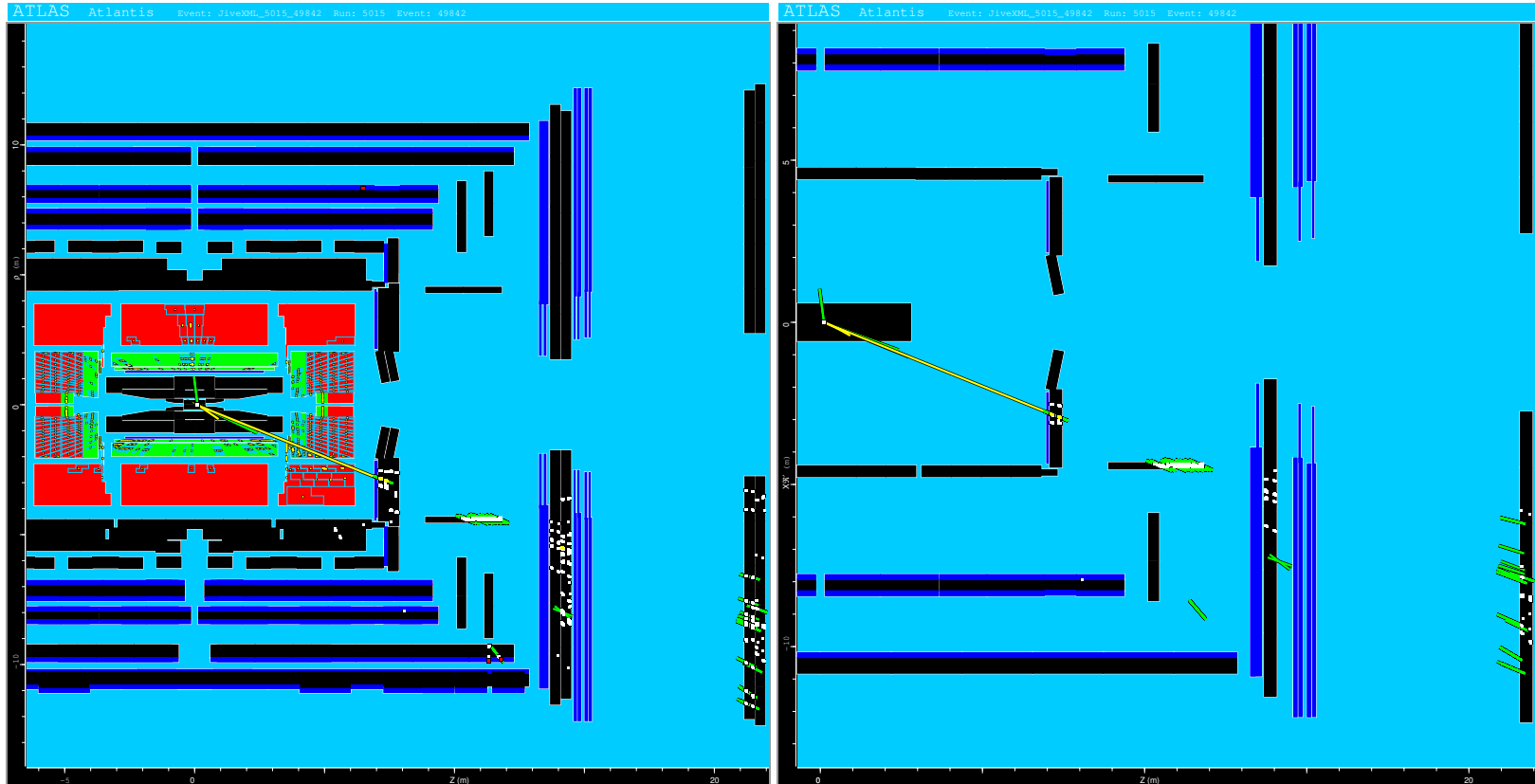
Event 49004: $E_T = 266 \text{ GeV}$, one muon with 248 GeV :



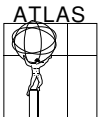
No big splash in muon chambers, but some extra hits. Missing segments?
Muon with 248 GeV matches ID track with $139 \pm 8.6 \text{ GeV}$?



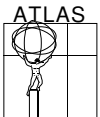
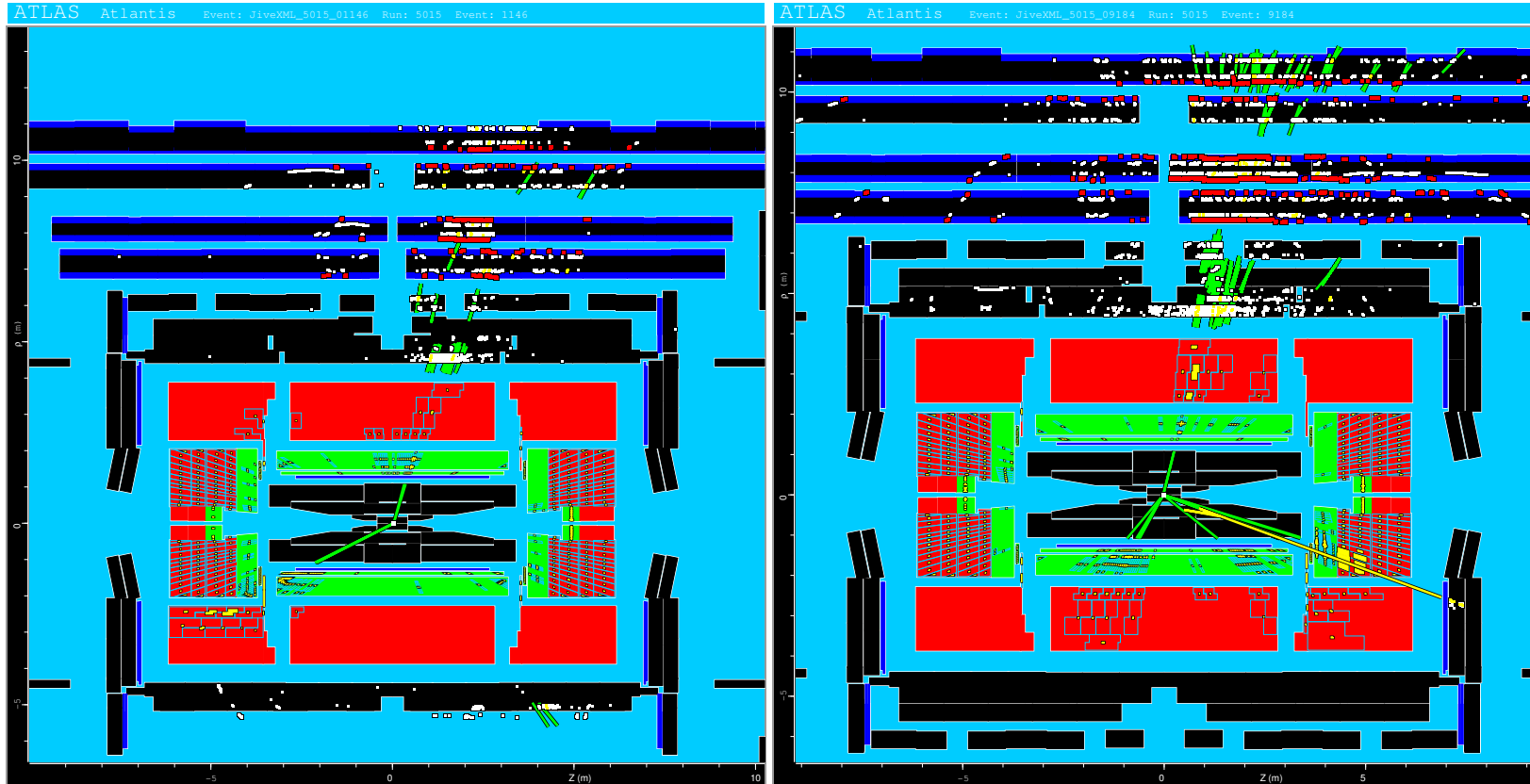
Event 49842: $E_T = 1266 \text{ GeV}$, one muon with 1310 GeV :

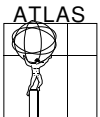
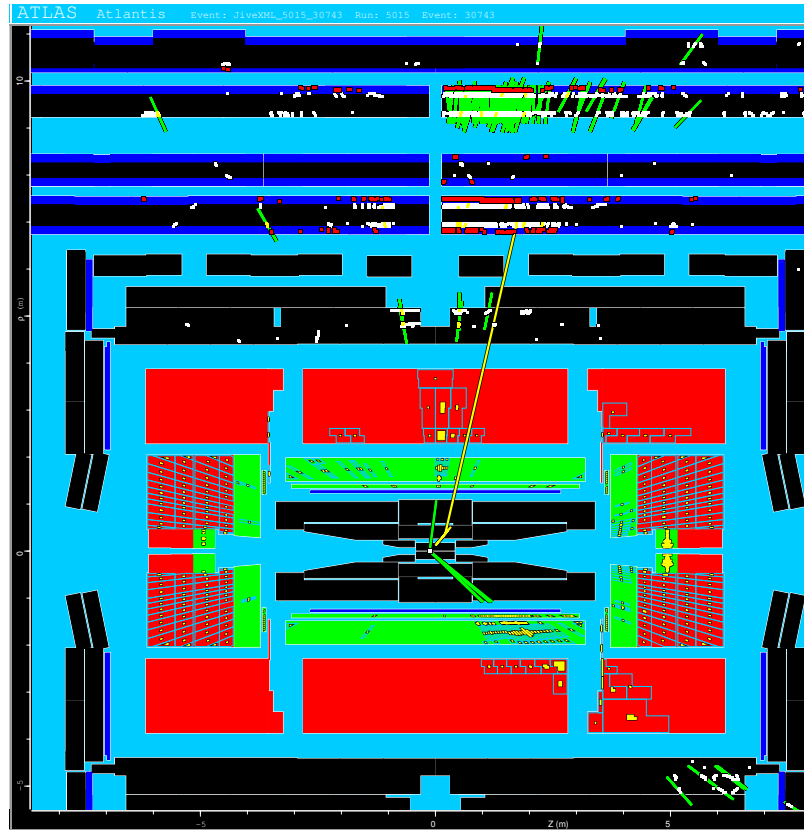


Muon with 1310 GeV matches ID track with $111 \pm 5.4 \text{ GeV}$? Give Moore credit for effort here. . . .

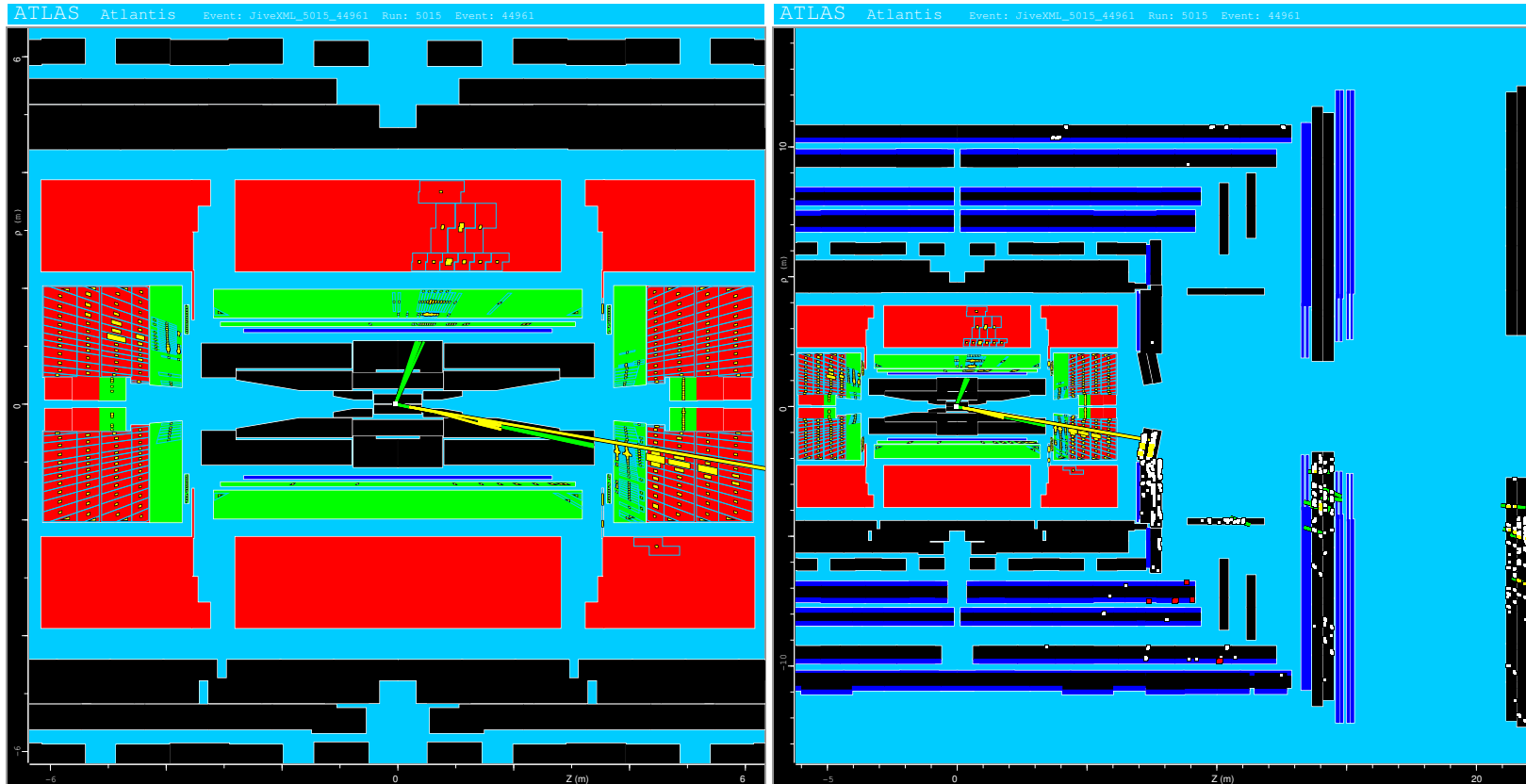


Three punchthrough events (1146, 9184, 30743) giving leakage and large muon showers:

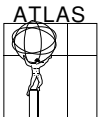




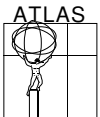
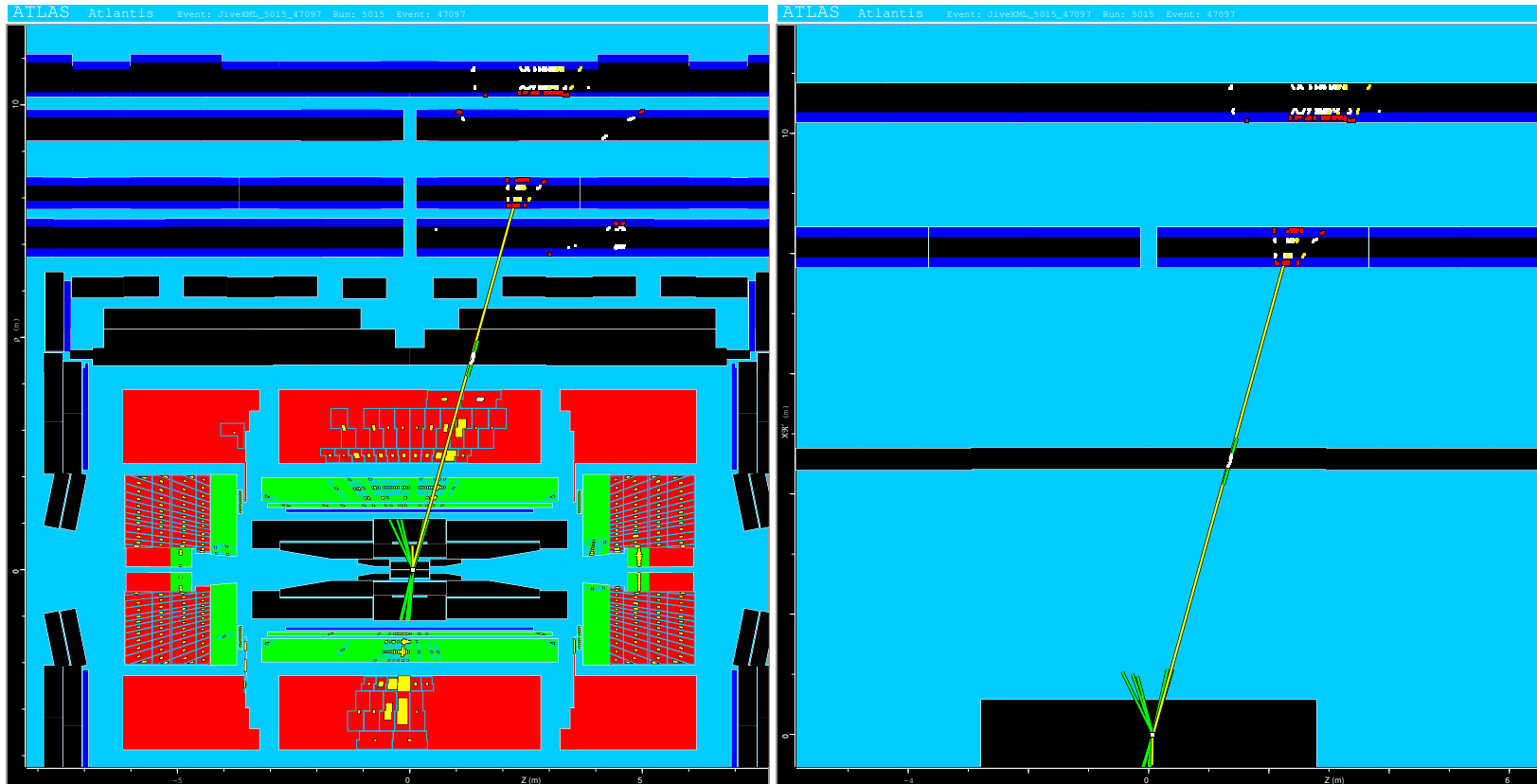
One event (44961) has $E_T = 1141 \text{ GeV}$, 2 muons with 1232 GeV :



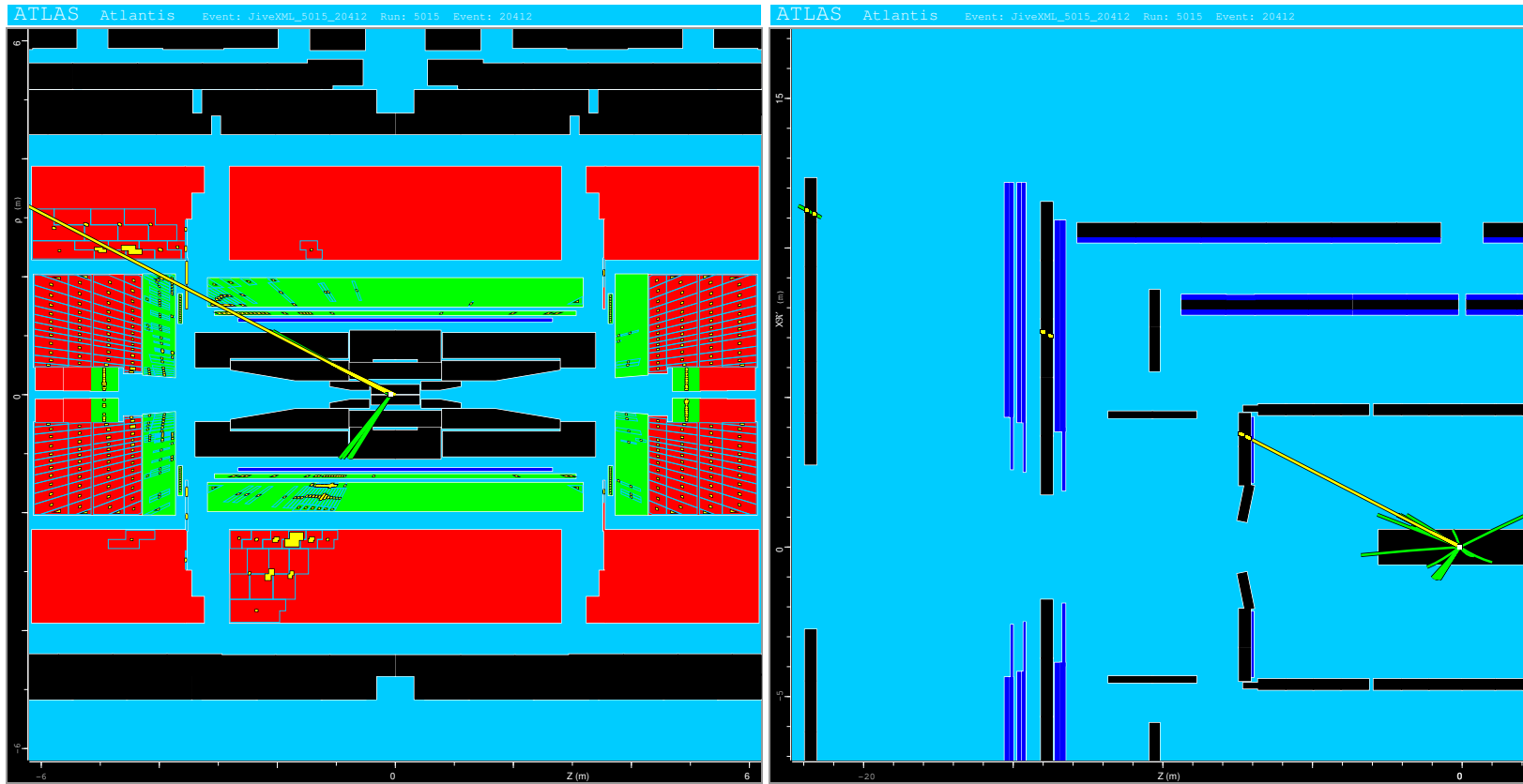
Muon with 1202 GeV matches ID track with $97 \pm 9 \text{ GeV}$?



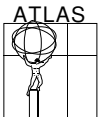
Final punchthrough event has only a few muon hits in inner station, evidence for shower in outer layers. Two muons with 27.3 GeV:



One weird event (20412): no evident leakage, $\Delta E_T = 302 \text{ GeV}$, clean muon with 286 GeV at same angle, Atlantis complains that “Invalid MuonETMisdata found: etx is 0”:



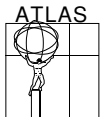
Muon missing in E_T ?



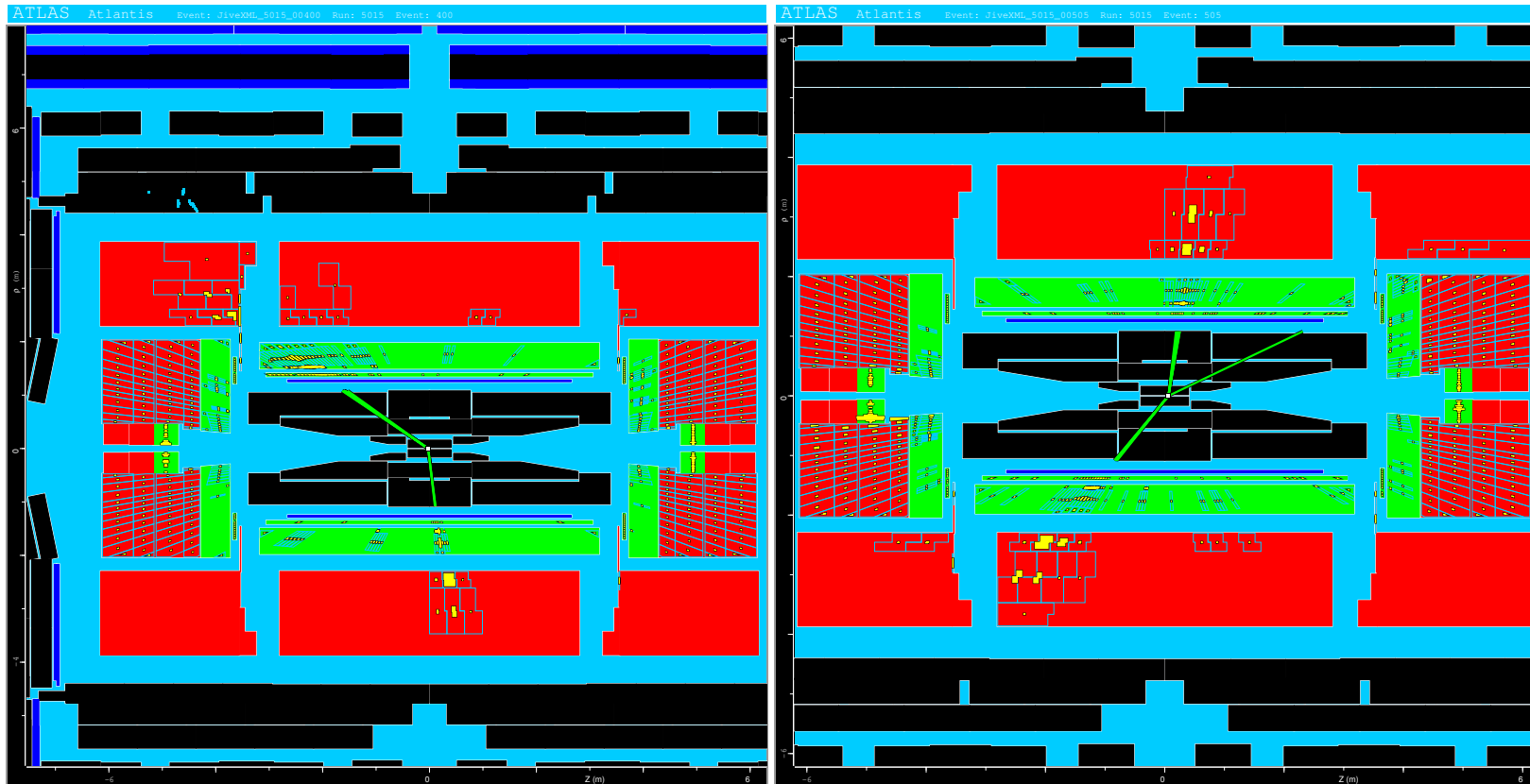
Next examine first 20 events with $\Delta E_T > 100 \text{ GeV}$. General observations:

- Much less leakage in muon system.
- No clear association with jets in cracks.

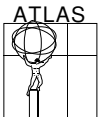
Will display just a few examples.



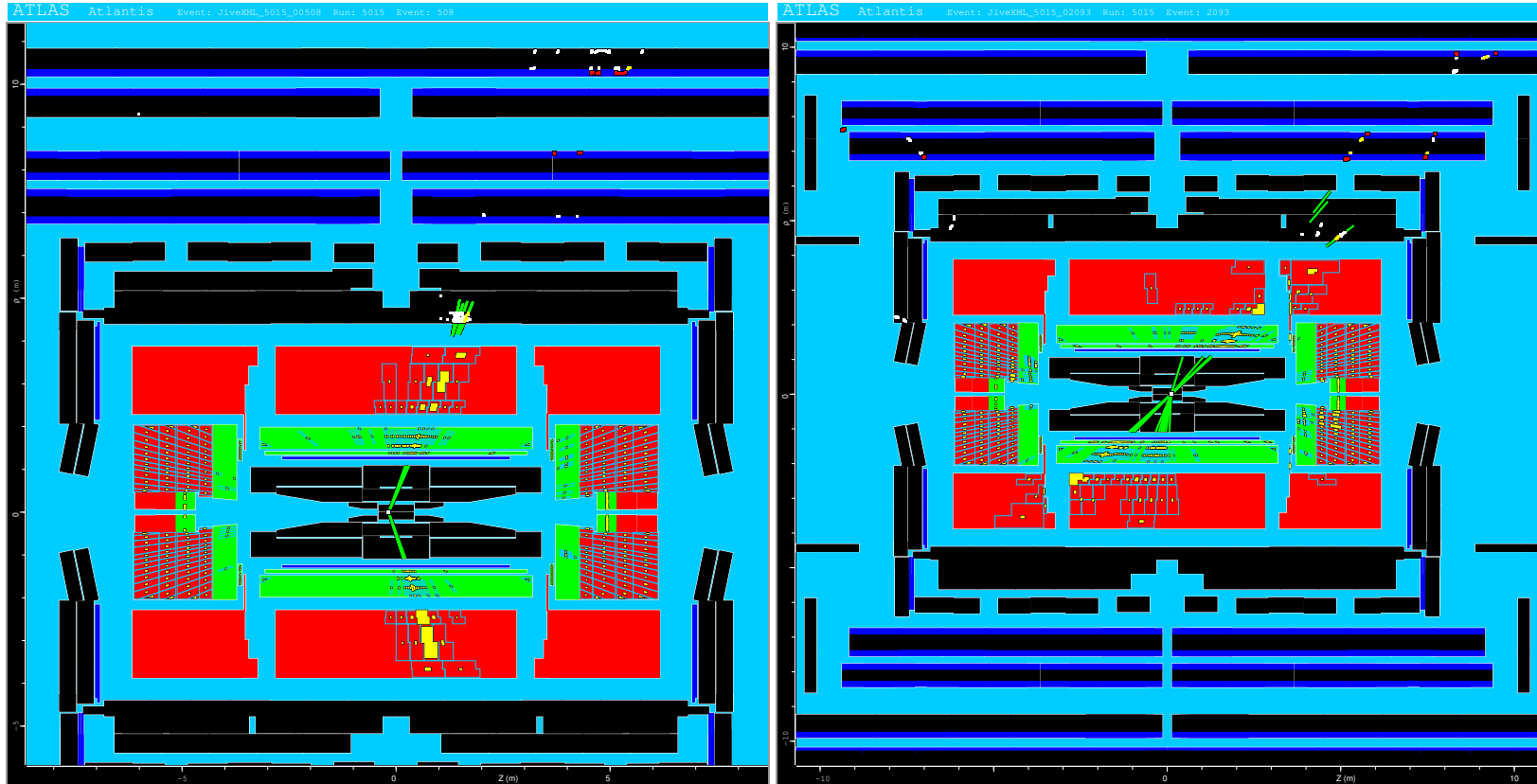
Typical events with $\Delta E_T \gtrsim 100 \text{ GeV}$ (same conventions as before):



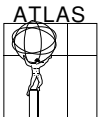
On right, apparent jet near crack is soft.



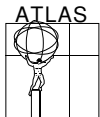
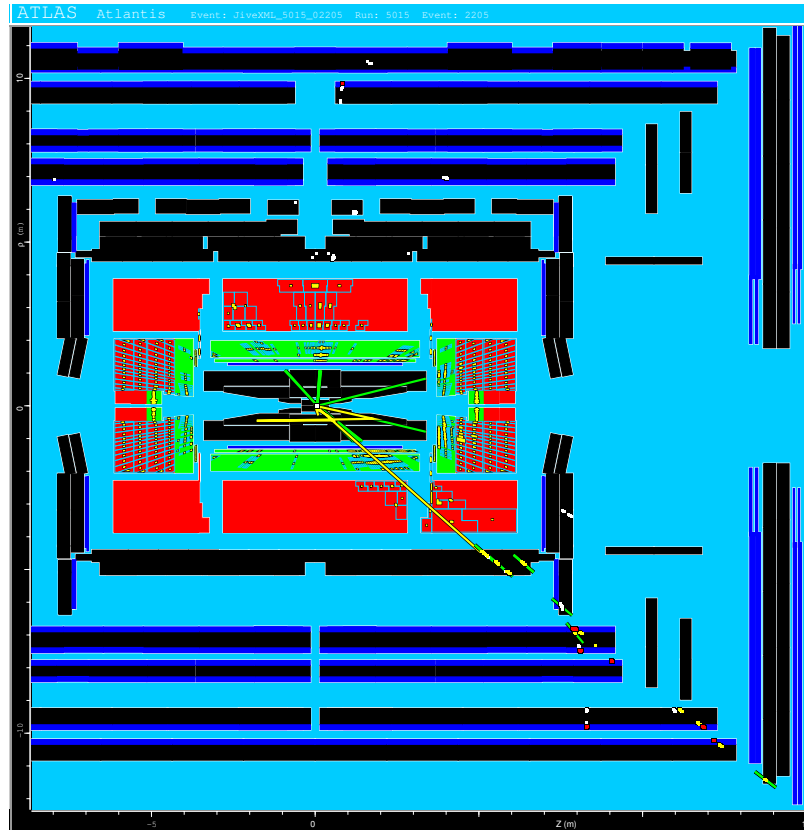
Only two events of 20 have significant muon showers:



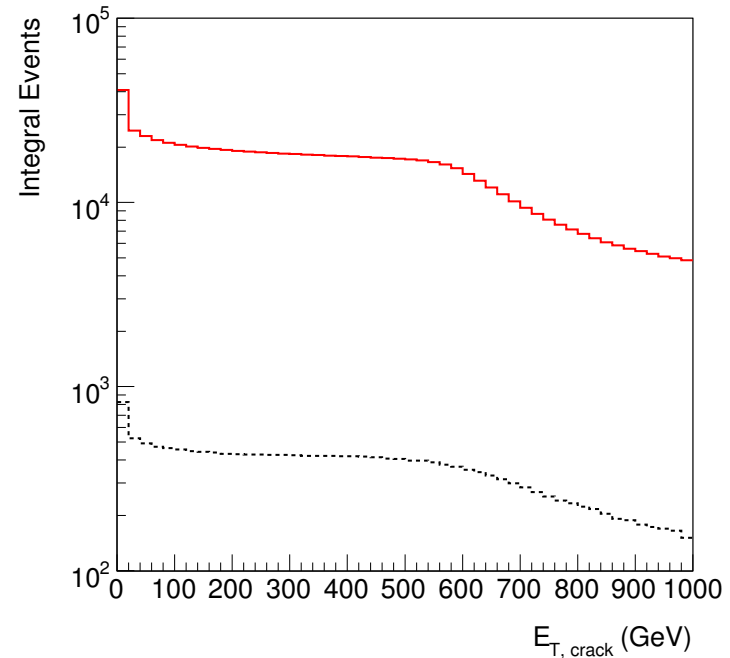
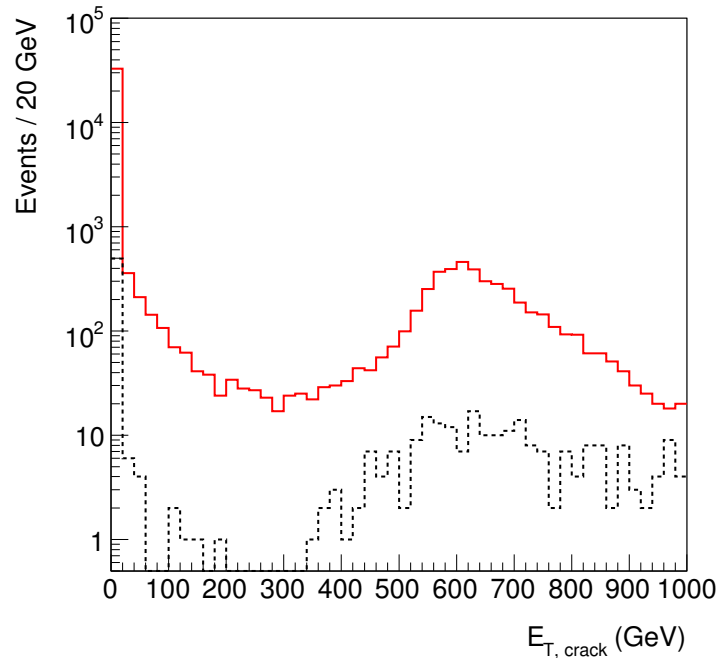
Less dramatic, so effectiveness of muon system veto not obvious.



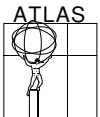
Also one event with (fake?) muon, but $E_T = 131 \text{ GeV}$, $p_{T,\mu} = 10 \text{ GeV}$:



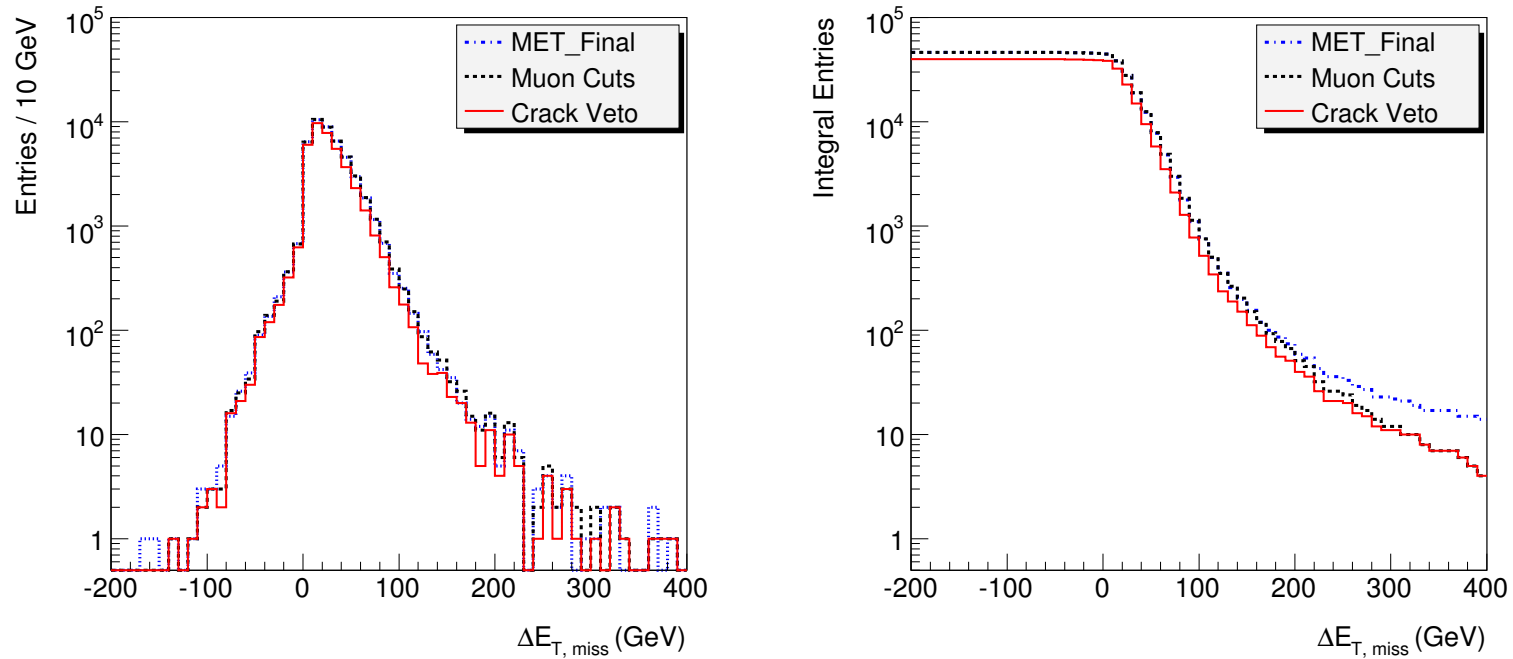
Must limit “crack” region to avoid vetoing multi-jet events. Choose $||\eta_j| - 1.4| < 0.3$, $|\phi_j - \phi_{\text{miss}}| < 0.3$. Plot $E_{T,\text{crack}}$: sum of such jets for $\Delta E_T < 50\text{ GeV}$ (solid) and $\Delta E_T > 100\text{ GeV}$ (dashed):



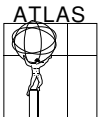
Evidently not very effective cut.



Also tried requiringing $E_{T,crack}$ less than second hardest jet. Only slight improvement (**solid**) over just eliminating muons with $\chi^2_{match} > 10$ (dash):



Estimate cut on muon chamber showers would reduce background for $\Delta E_T > 250$ GeV by factor of ~ 10 from MET_Final (**dash-dot**).



Conclusions

For $\Delta E_T > 250 \text{ GeV}$:

- Shower leakage from both punchthrough and cracks important. Veto on muon chamber activity looks effective.
- Fake muons also important; can reduce with $\chi_{\text{match}}^2 < 10$ cut.

For $\Delta E_T \gtrsim 100 \text{ GeV}$:

- Less muon chamber activity ($\sim 10\%$).
- Cracks do not seem dominant. Hard to filter at generator level?

Need in AOD:

- (1) Summary of muon chamber segments/hits. Format?
- (2) More muon quality information: perhaps number of stations, missing hits, unused “nearby” hits.

