

PFA for production

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What's new since Boulder

- Complete refactoring of PFA to make it easier to maintain.
- Use of new tracking code from Rich et al.
 - `org.lcsim.recon.tracking.seedtracker.ReconTracking.SiD02ReconTrackingDriver`
- Changes to muon system handling & new calibration.
 - sid02 had a weird design: 2 active elements in each layer -- buggy.
 - We now remove all hits from outer element.
 - Calibration adjusted to take into account.
- Various bugfixes & improvements.

Refactoring

- Separable pieces of the huge ReclusterDTreeDriver removed and made into separate classes.
- Main objective: Make the code easier to maintain & develop.
- Clustering, track-cluster matching, lepton ID now done beforehand in external classes -- ReclusterDTreeDriver only responsible for building showers and making ReconstructedParticle output.
- Book-keeping simplified.
- Some streamlining -- code taken out.
- Not 100% refactored, but enough for now.

Refactoring (ctd)

- Low-energy performance a bit worse after refactoring
 - Affects qq100, qq200, ZZ
 - Forward performance affected by change in MCAL calibration that helps for high energies at the expense of lower energies
 - May also be due to taking out some complicated seed-splitting code.
 - Numbers coming up on next slides.
- Could probably tinker more to recover performance -- but not worth delaying production run over.

Performance -- barrel

sid02	Before refactoring	After refactoring	
	Cheat tracks (#441) LocalHelixExtrapolation	Cheat tracks (#520) TrackHelixPlusHitExtrapolation	Real tracks (#532) TrackHelixPlusHitExtrapolation
qq100	3.5%	3.6%	3.7%
qq200	2.8%	2.9%	3.0%
qq360	2.6%	2.6%	2.7%
qq500	3.5%	3.5%	3.5%
ZZ	4.2%	4.3%	4.7%

There's still a performance hit of ~ 0.4% from using real tracks, but this is a significant improvement over September version (1.0%)

Performance -- forward

sid02	Before refactoring	After refactoring	
	Cheat tracks (#441) LocalHelixExtrapolation	Cheat tracks (#520) TrackHelixPlusHitExtrapolation	Real tracks (#532) TrackHelixPlusHitExtrapolation
qq100	3.4%	3.7%	3.8%
qq200	2.9%	3.1%	3.2%
qq360	2.8%	2.7%	2.7%
qq500	3.8%	3.4%	3.3%
ZZ	3.8%	3.8%	3.9%

Weirdness in muon endcaps better understood now.
(2 active elements in 1 layer = confusion!)

Conclusions

- Code runs OK over standard qq/ZZ samples.
- Ron has run previous version of code over largish SM/LOI test sample -- few crashes, now understood & fixed.
- Performance can always be improved (truism) but no known serious issues or improvements that are significant, fast, and simple.
- Performance with real tracking vs cheat tracking:
 - Pretty close for energy sums in qqbar events at all energies
 - Worse for ZZ dijet mass in barrel (4.3% vs 4.7%), but not unexpected and not a huge difference.
- We believe this is a candidate for production running.