Validating New ECL Digitizer for pre-release build

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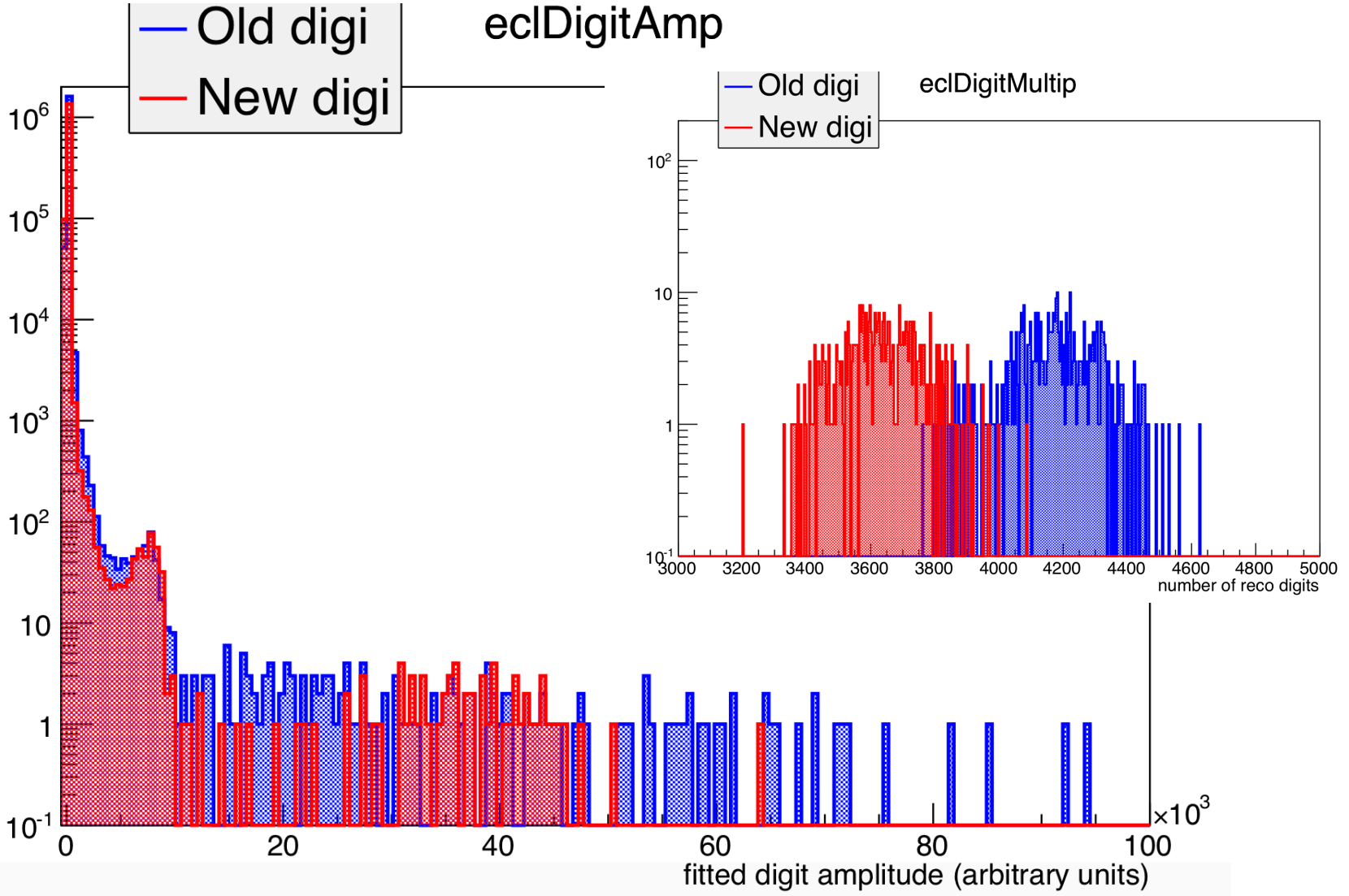
New Digitizer validation

- Old digitizer (build-2015-01-03) vs New digitizer (pre-release build-2015-04-19 with correct reading of covariance matrix rootfiles) Comparison done with the following samples:
  - 1000 events with machine background *(RadBhabha, Coulomb and Touschek)*
  - 500 MeV single photon events
  - Full detector configuration
  - ECL angular acceptance: [40°,120°] and [20°,24°]
- First look at cluster distributions separating signal and background contributions using MC information

ECL Barrel – Old vs New Digitizer

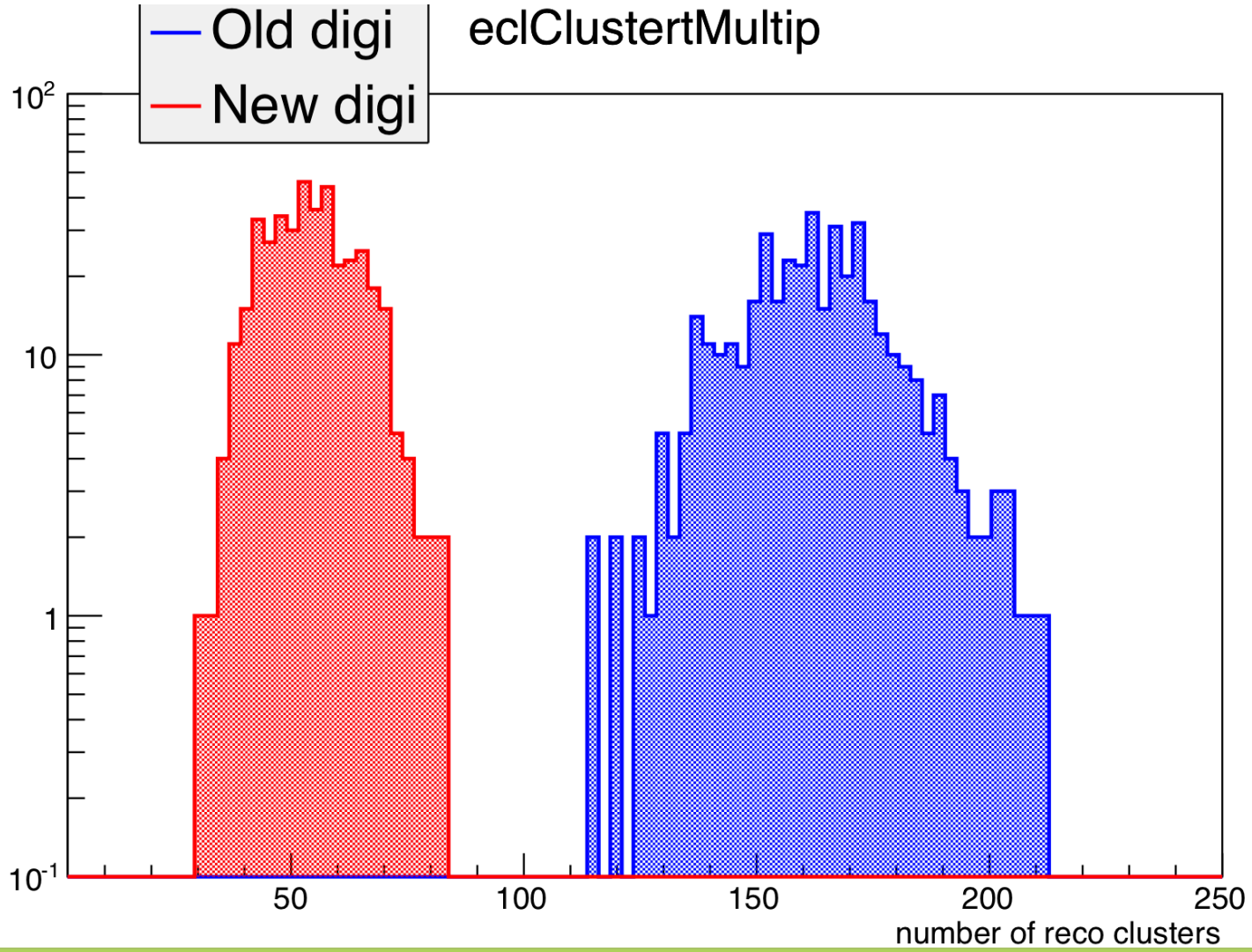
Digit Info: ECL Barrel

- Resolution seems improved already at the Digit level



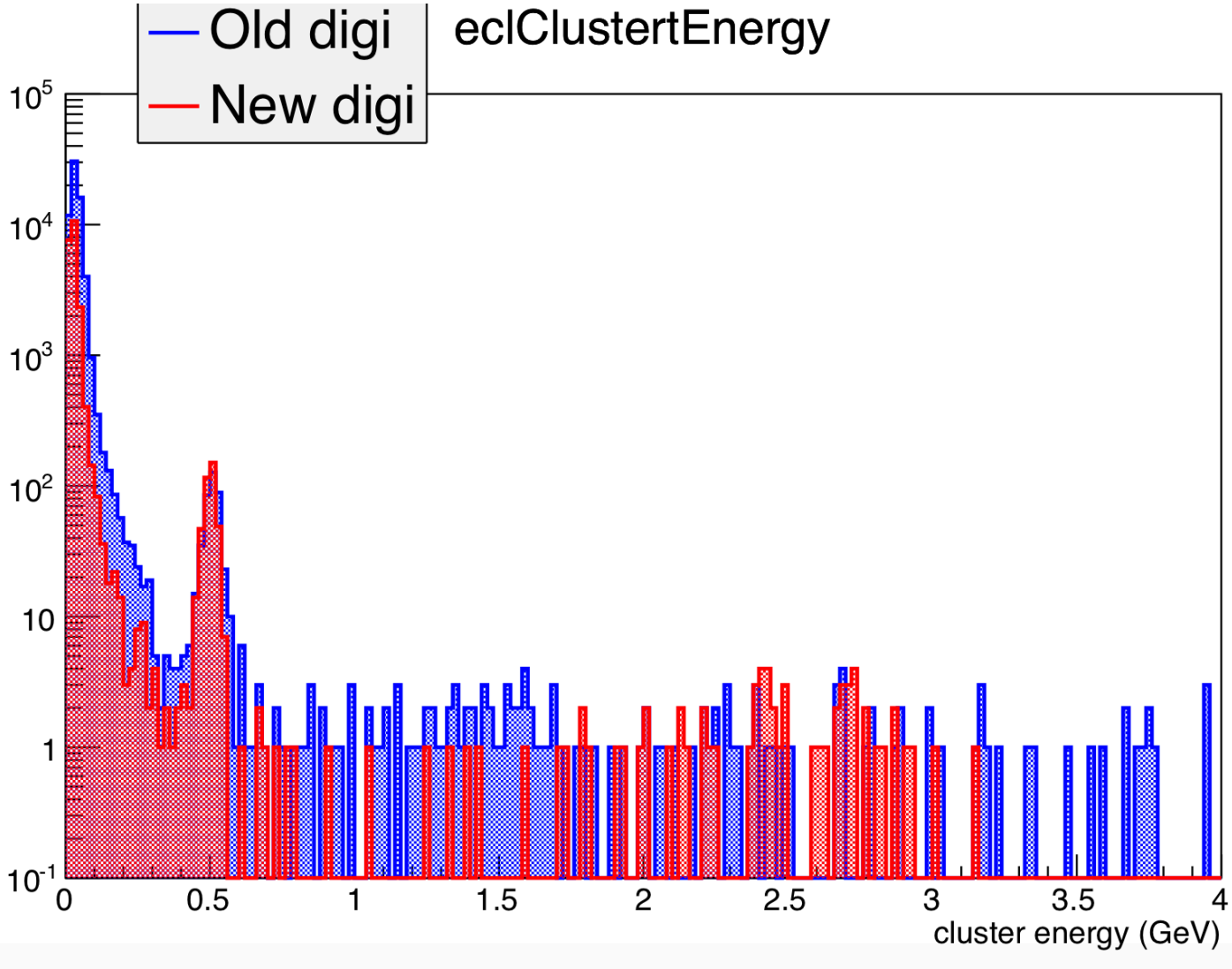
Cluster Info: ECL Barrel

- Sizable reduction of Cluster Multiplicity



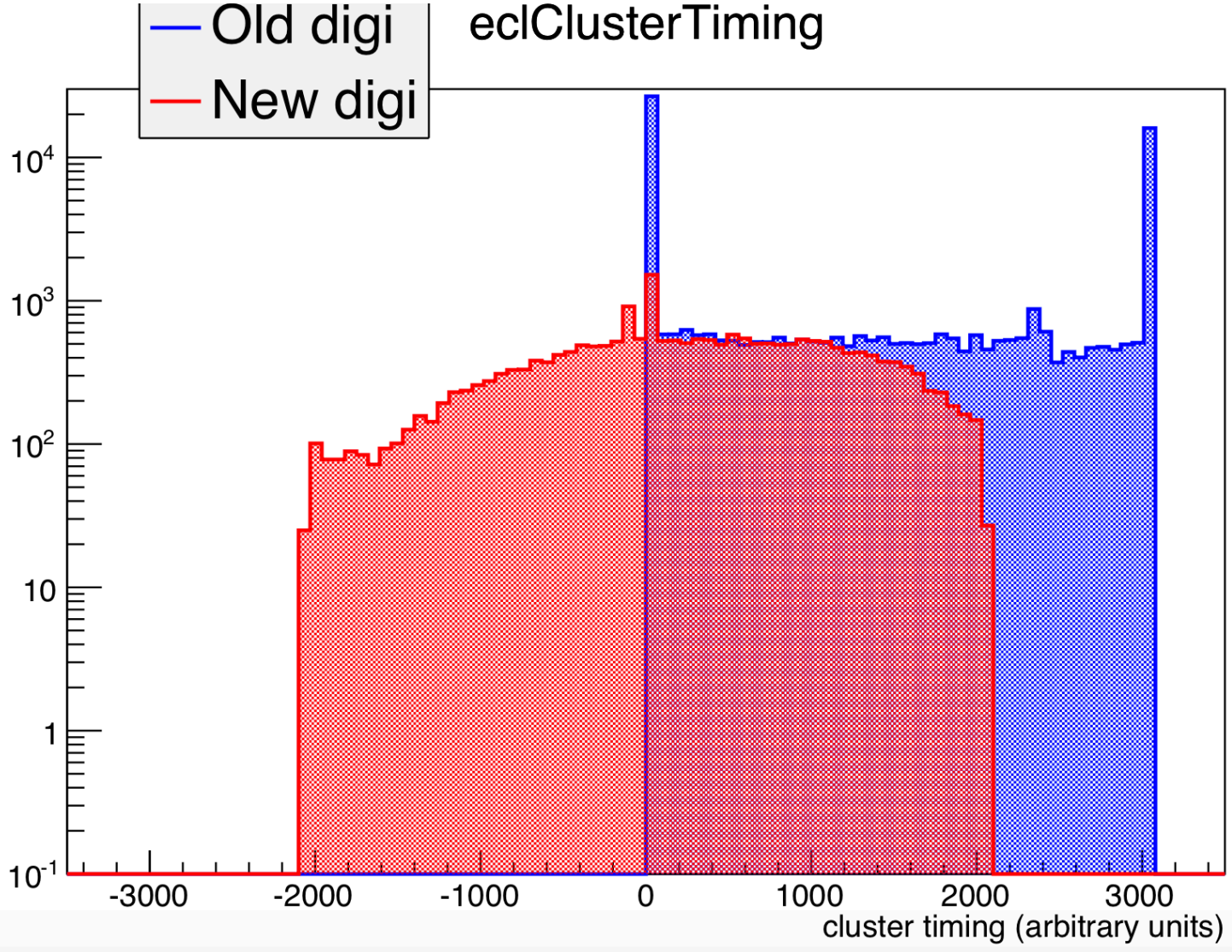
Cluster Info: ECL Barrel

- Resolution on Cluster Energy clearly improved

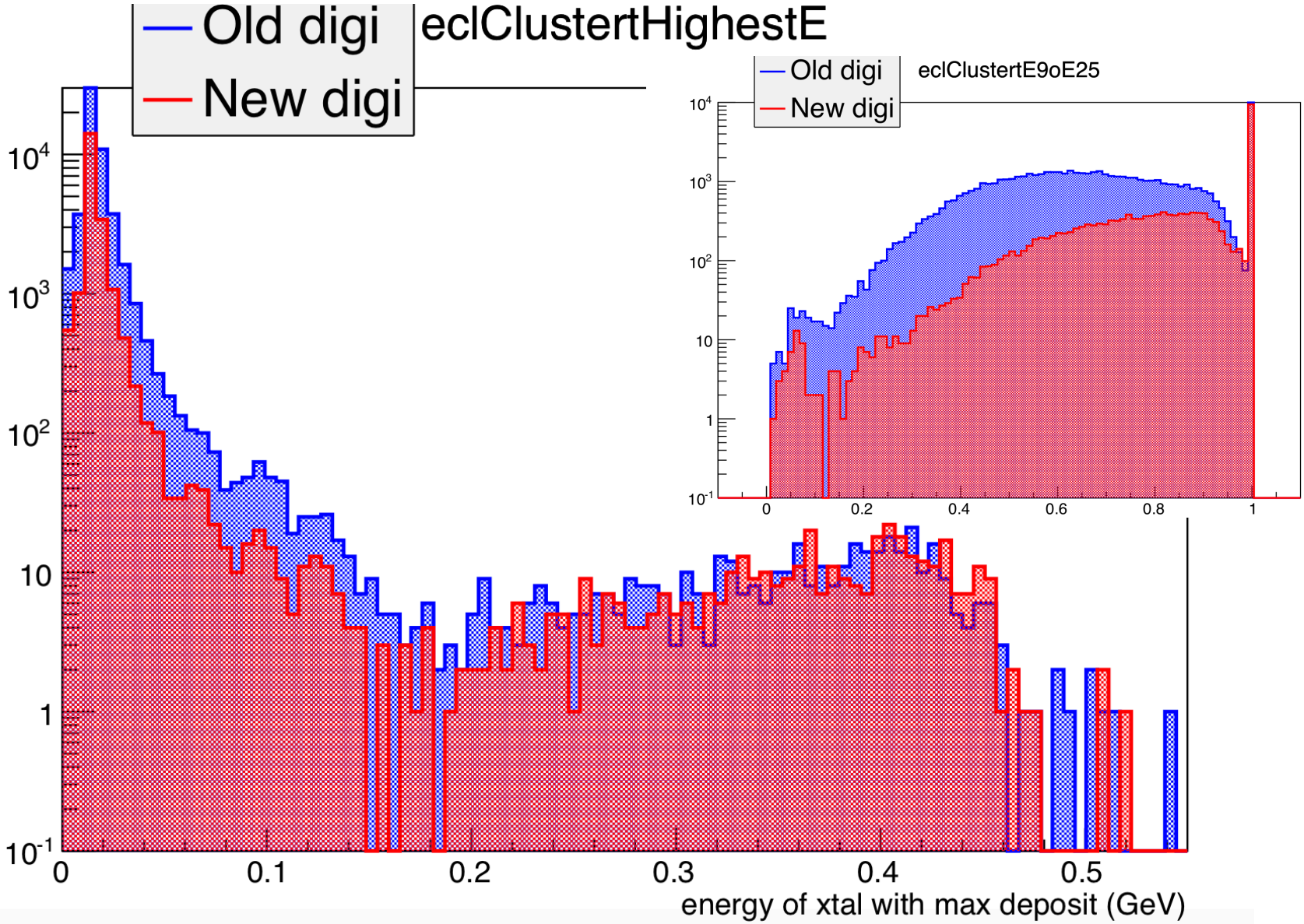


Cluster Info: ECL Barrel

- Two peaks visible in New Digitizer Cluster Timing (see MC Info)



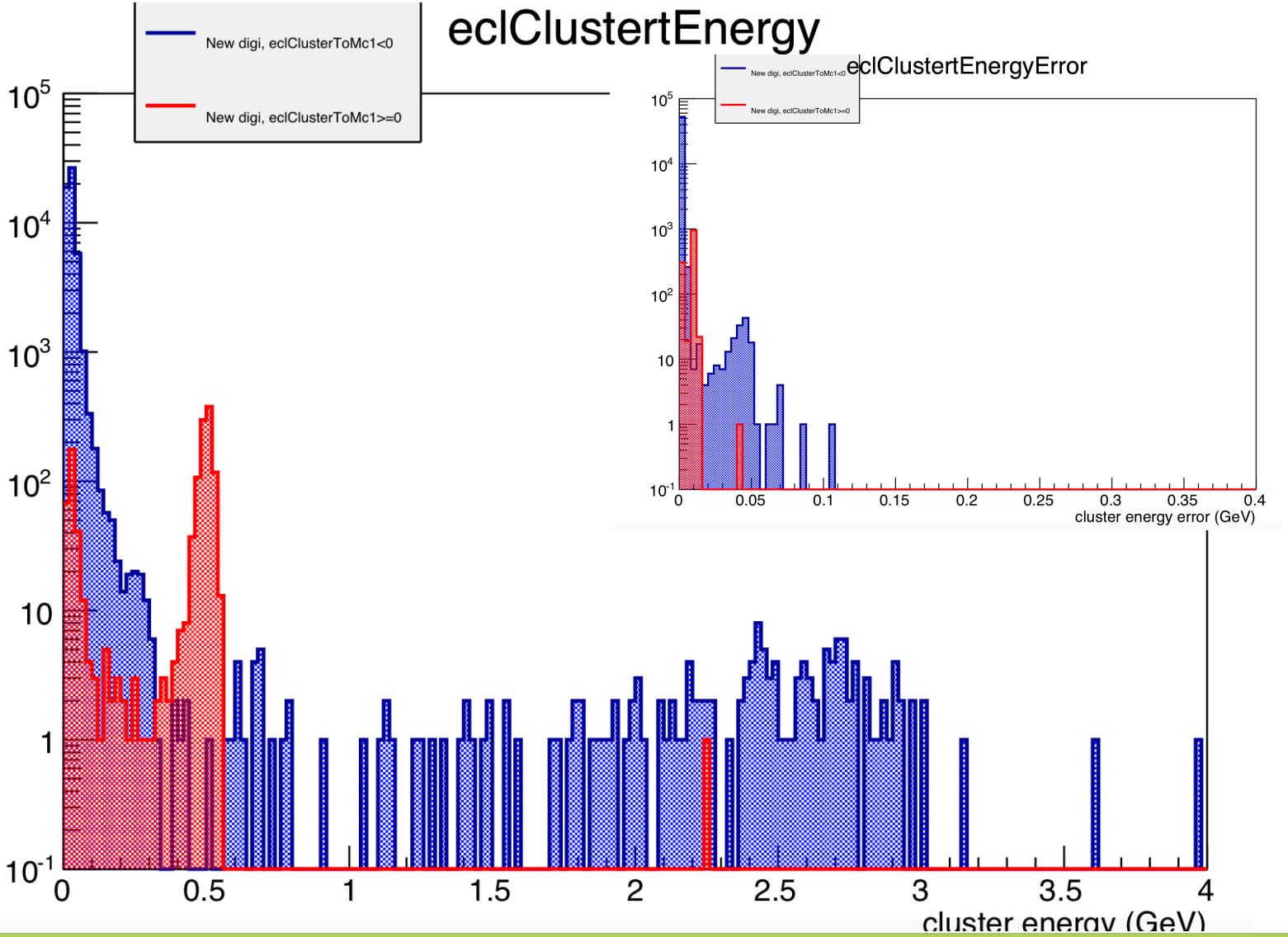
Cluster Info: ECL Barrel



First look at Cluster distributions with MC Info

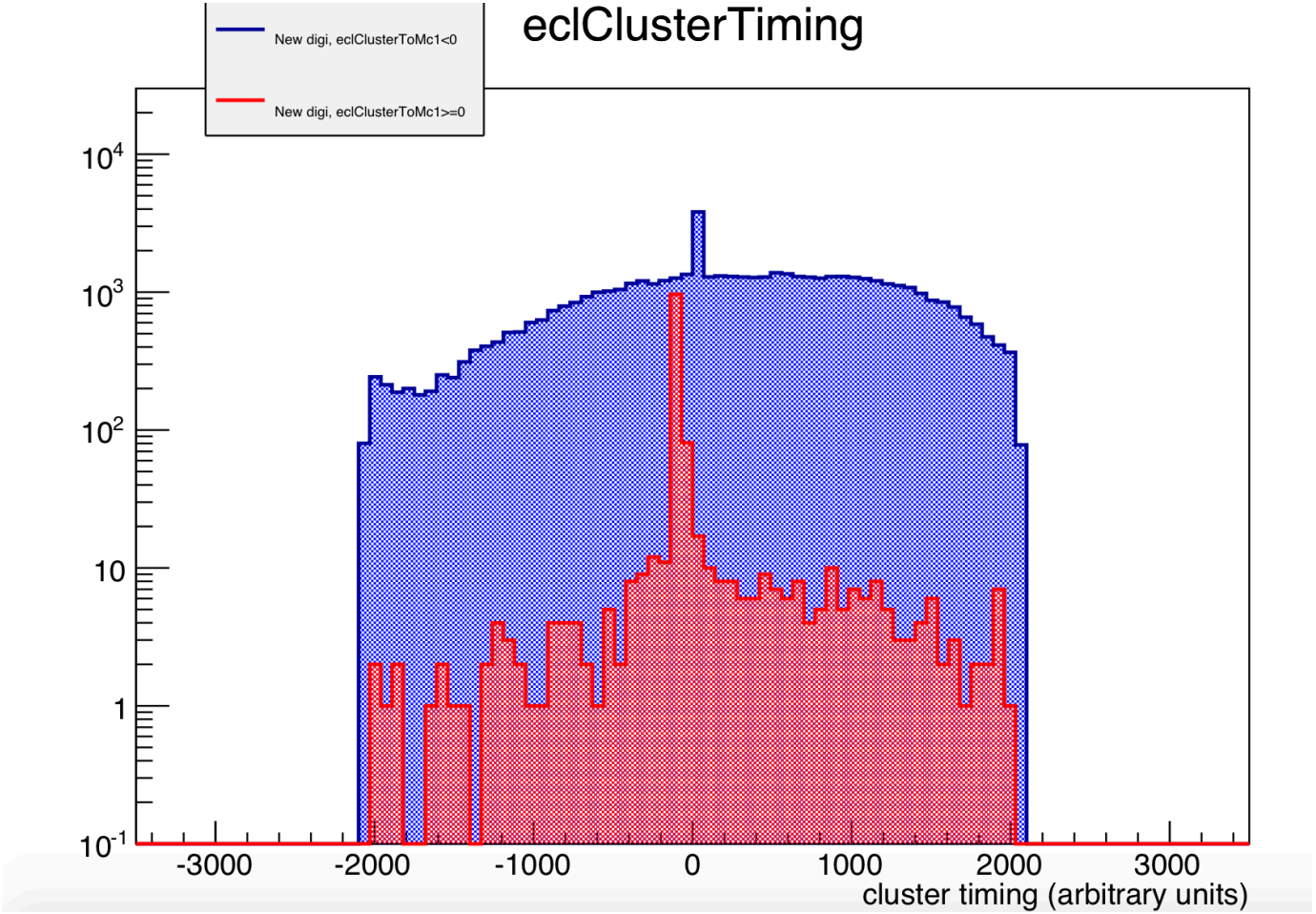
Clusters with MC Info: ECL Barrel

- Multiple clusters per event associated to the same particle

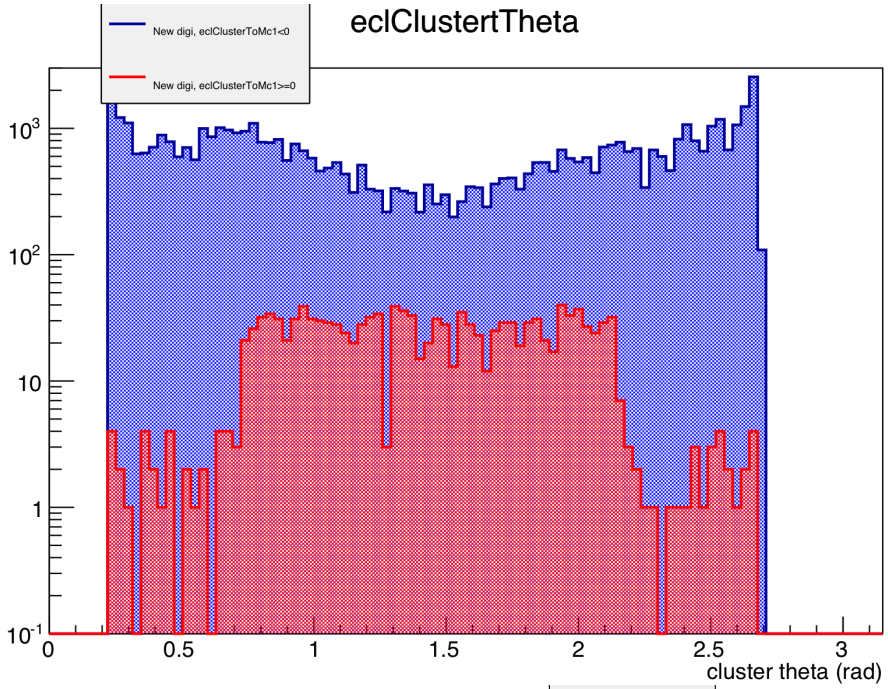


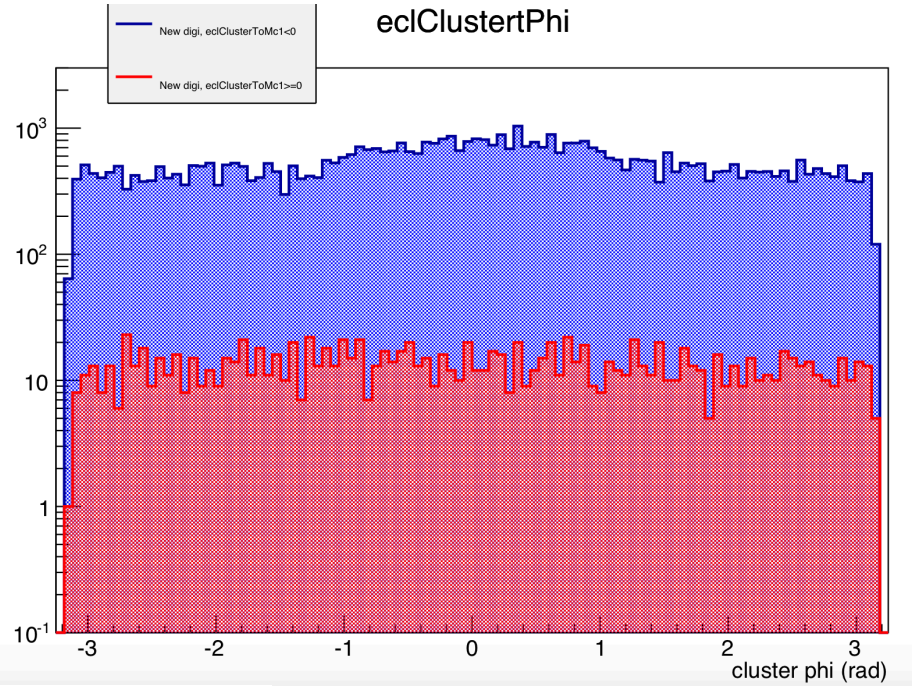
Clusters with MC Info: ECL Barrel

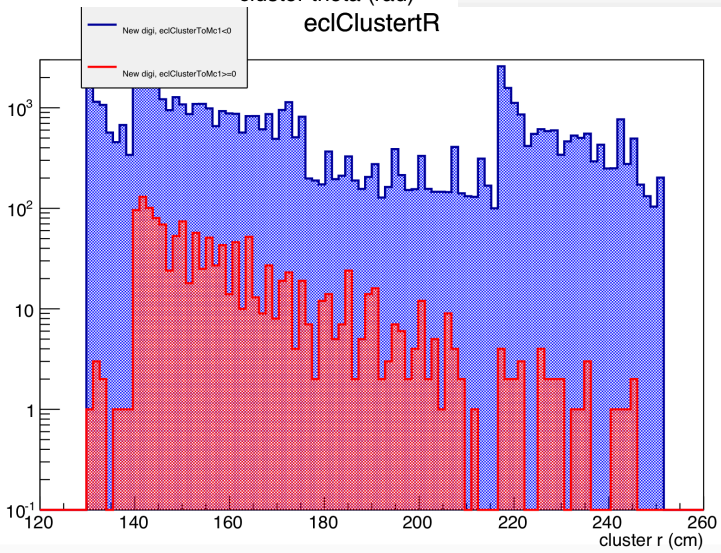
- Timing different for signal and background (*to be investigated*)
  - Signal peaked around -80 a.u.
  - Background peak at zero due to waveform fits with no TimeFit output



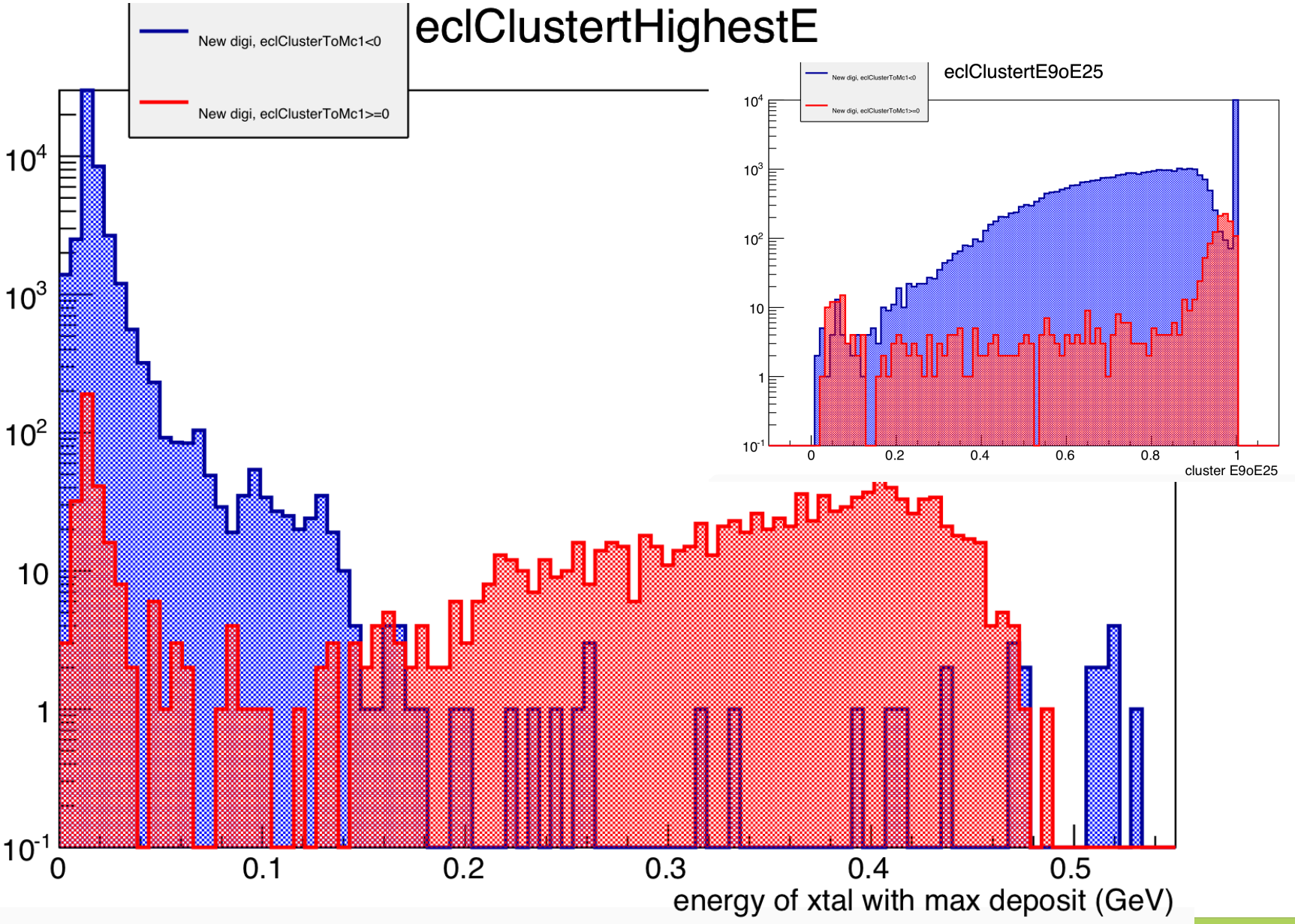
Clusters with MC Info: ECL Barrel







Clusters with MC Info: ECL Barrel



Conclusions

- Validated New ECL Digitizer for pre-release build ✔
- MC-truth studies to distinguish background and physics contributions started
- Timing of signal and background to be investigated (*A. Bobrov*). What should we do with events with eclClusterTiming = 0? (Events related to waveform fitting not providing a TimeFit)
- Signal/Background rejection study with a sample of low-energy 0.05 GeV single-photon events
- To further reduce background contribution: Timing information to be exploited at the Clustering algorithm level together with a threshold on the eclDigitAmp

New ECL Digitizer inserted in the May Integration build