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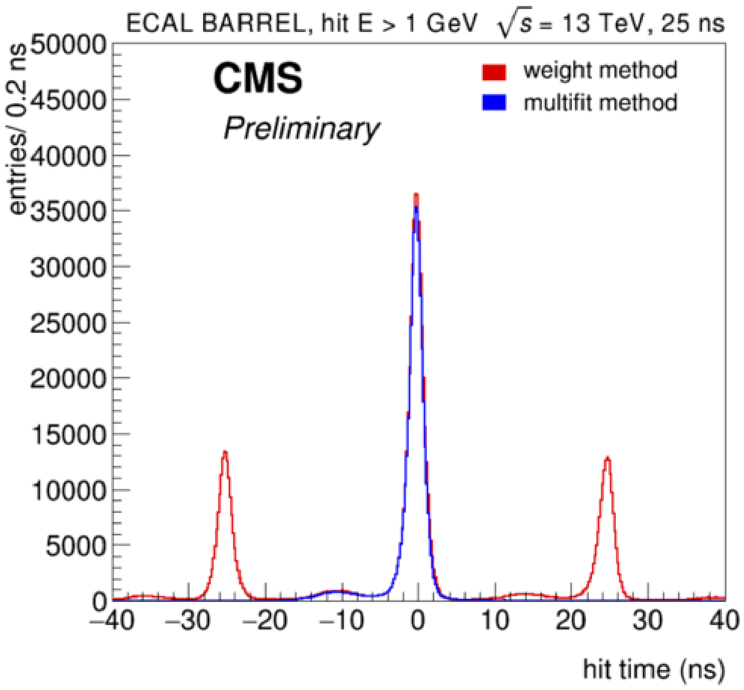
ECAL hit timing with Run1 and Run2 energy reconstruction in early 25ns data at 13

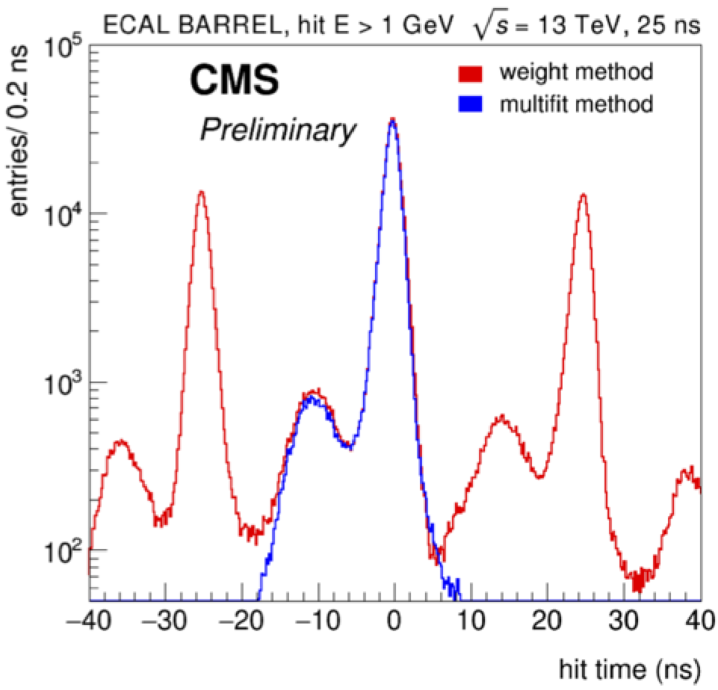
ECAL performance plots approval for LHCp 2015, contained in CMS DPS 2015-040.

Abstract

In the following hit time distributions in the electromagnetic calorimeter barrel are presented for hits with measured energy larger than 1 GeV in collision data at sqrt(s)=13 TeV and 25 ns bunch spacing. Hit time distributions are presented using two different methods for energy reconstruction: the weights method (default during Run 1) and the multifit method (developed for Run 2). With the weights method the energy deposits in bunch crossings (BX) different from the one firing the trigger contribute to the hit energy. The multifit method largely reduces the contribution to the hit energy from out of time energy deposits. The time reconstruction method is the same as used in Run I and does not depend on the method used for energy reconstruction (multifit or weights). The reconstructed hit energy has an influence on the timing plots due to the energy cut applied (1 GeV) in order to avoid possible noise contamination.

Figures

Figure	Caption
pdf version  pdf version log scale	***timing in ECAL barrel*** The plot shows the timing distribution of the hits in the ECAL barrel with a reconstructed energy above 1 GeV. Different energy reconstruction methods are compared: in red the "weight method" which was the default method used in Run I, in blue the "multifit method" which is the default method used in Run II. It can be seen that the multifit is effective in suppressing the contribution to the reconstructed energy from energy deposited in early or late bunch crossings. The apparent lack of events in the peak at t=0 ns with the multifit method is due to a slightly different response of the two methods at low energy. The component of the distribution around -10 ns is due to anomalous signals ascribed to direct energy deposition by particles in the APDs. Unlike the hits in an electromagnetic shower, the anomalous signals generally affect single crystals in the calorimeter. This feature is employed in the reconstruction of higher level objects to reject them by a combination of a topological selection and a cut on the hit timing. For more details see CMS Note 2010/012, sec. 4.2. For this plot the timing cut is not applied and the contribution of the anomalous signal surviving the topological selection is visible.



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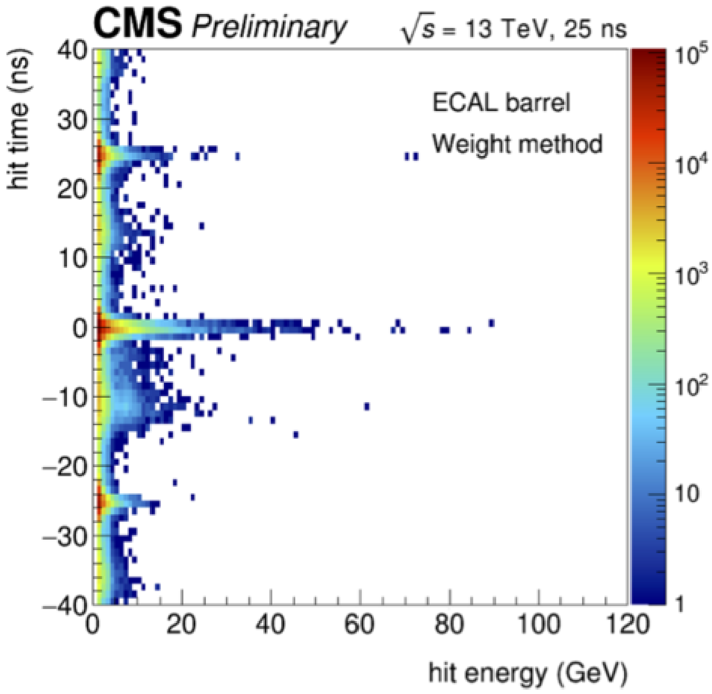
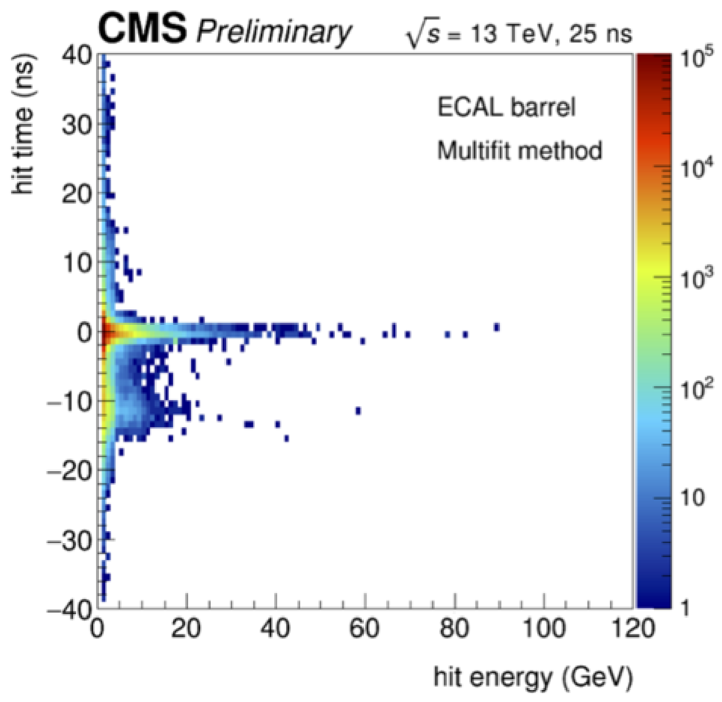


pdf version

Hit energy vs timing in ECAL barrel

The plots show the distribution of the reconstructed energy as a function of the hit timing, considering only hits in the ECAL barrel with a reconstructed energy above 1 GeV. The hit energy is reconstructed with the "weight method" (plot on the top), and with the "multifit method" (plot on the bottom). As in previous plots, the component of the distribution around -10 ns is due to anomalous signals that survive the topological selection.



-- EmanueleDiMarco - 2015-08-31

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