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Energy and time resolution for a LYSO matrix prototype of the Mu2e experiment

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A beam test of the prototype LYSO electromagnetic calorimeter for the Mu2e experiment at Fermilab has been performed at the beam test facility, BTF, of the Laboratori Nazionali di Frascati of INFN using electrons from 100 to 450 MeV. The time resolution of the 25 crystal matrix, readout by large area APD of Hamamatsu, has been measured with two techniques and compared with Monte Carlo simulations. A time resolution of $\sim$ 160 ps is obtained at 100 MeV.

The first technique uses the timing of each single photosensor as derived by a fit to the signal pulses recorded with a 250 Msps Waveform Digitizer with respect to the timing provided by two scintillator counters. A second method uses instead the time difference between two neighbour cells thus allowing us also to estimate the timing resolution with the tagged photon beam of the MAMI (Mainz Microtron) facility.

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