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The response of PWO scintillators for the PANDA electromagnetic calorimeter at low energy, using different light sensors

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The central electromagnetic calorimeter (EMC) of the PANDA detector consists of a barrel part with 11 360 PWO crystals of 11 different shapes, a forward end cap with 3864 crystals and a backward end cap with 592 crystals. The complete EMC will sit in a solenoid field, which rules out the use of photomultiplers as light sensors. Avalanche Photo Diodes (APDs) will be used for the barrel part to detect the scintillation light. For the forward end cap a faster readout is probably needed, due the larger rate of photons/particles per crystal. So called Vacuum Photo Triodes (VPTs) or Vacuum Photo Tetroides (VPTTs) are proposed to use here, at least for the more central part.

In order to fully reconstruct events in the PANDA detector a high efficiency is essential for detecting individual gamma rays. In the Technical Design Report of the EMC [1] it is specified that an energy threshold not exceeding 3 MeV for individual crystals and an energy resolution of 16.4% at 15 MeV and 8.2 % at 60 MeV should be obtained.

In a series of experiments at the tagged photon facility at MAX-Lab, Lund we have studied the response of forward end cap crystals to gamma rays in the low energy part of the spectrum, approximately between 10 and 60 MeV. Here we will present results for the energy resolution using VPTs and APDs as light sensors and compare these to results for photomultipliers.

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