

Test of Avalanche Photo Diodes

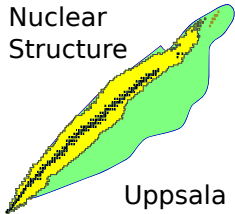
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Nuclear
Structure



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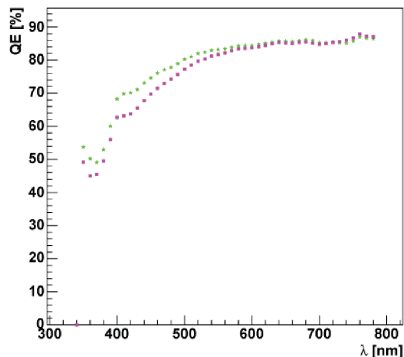
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Motivation

The number of photoelectrons in the slow component of the signal from a neutron detector based on a liquid scintillator + PMT is very small, in particular for neutrons depositing a low energy in the scintillator.

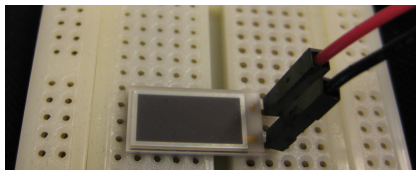
One reason for this is the relatively small quantum efficiency of PMTs: $QE \lesssim 35\%$ (UBA).

Avalanche Photo Diodes (APD): $QE \approx 70\%$ at 425 nm (peak wavelength of BC501A).

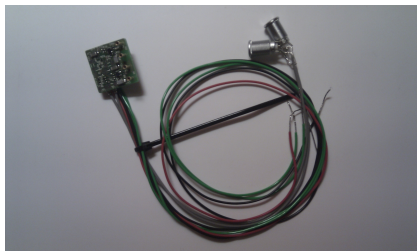


PIN diode (squares), large area APD (stars).
Private comm. A. Wilms (GSI, PANDA).

APD and preamplifier



Hamamatsu APD used by the PANDA EMC (PbWO_4). Dimensions: 7 mm \times 14 mm.



Charge-sensitive preamplifier developed by KVI for the PANDA EMC.

Planned tests:

- Collect waveforms with a thin fast plastic scintillator + APD + PA using a β source; check time resolution.
- Collect waveforms with a liquid scintillator + APD + PA using a ^{252}Cf source; check neutron-gamma discrimination.
- ...