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Significantly Improved Lifetime of Microchannel-Plate PMTs

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The PANDA experiment at the new FAIR facility at GSI will perform charmonium spectroscopy and search for gluonic excitations using a high luminosity antiproton beam. The main components of the particle identification system will consist of DIRC (Detection of Internally Reflected Cherenkov Light) detectors residing inside a magnetic field of up to 2 Tesla. The most attractive sensors to detect the Cherenkov photons are multianode microchannel-plate (MCP) photomultipliers (PMT) which allow single photon detection with excellent performance inside B-fields.

The drawback of MCP-PMTs until recently was their limited lifetime which mainly arises in a rapidly decreasing quantum efficiency of the photo cathode at high photon rates. However, in the latest models of PHOTONIS (XP85112), Hamamatsu (R10754X), and BINP different techniques are applied to reduce the aging effects.

We are currently performing lifetime measurements for these new types of MCP-PMTs by simultaneously illuminating all improved tubes with the same photon rate. This should allow a fair comparison of the lifetime for all investigated MCP-PMTs and possibly a judgement on the best technique for an enhancement of the lifetime.

In this paper performance measurements will be discussed with a special focus on extensive aging tests. The lifetime improvements in comparison to the older MCP-PMT models are more than an order of magnitude based on an extracted anode charge of ~2 C/cm^2.

for the collaboration

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