Recent progress in photomultiplier tubes for Cherenkov counters

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Abstract

The need to operate Ring Imaging Cherenkov (RICH) counters in high magnetic fields, exceeding 1 T, requires a replacement of the by now standard devices, multianode PMTs, with micro-channel plate (MCP) multianode PMTs. PMTs with micro-channel plates have shown excellent performance in on-the-bench and beam tests. Their further advantage is their very fast response for single photons ($\sigma \approx 50$ ns).

In the present contribution we will review the results of on-the-bench and test beam studies of two types of Burle multi-anode micro-channel plate (MCP) PMTs, with 25 μm and 10 μm pores, as well as of Hamamatsu multianode MCP PMTs. We will discuss the timing properties of the tubes, and studies of various cross-talk sources and their influence on the timing and spatial resolution.

Finally, we will discuss possible applications of this kind of photon detectors for time-of-flight counters, or in a combination of a RICH and a time-of-flight counter, as well as in focusing DIRC and time-of-propagation counters.

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