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MCP-PMT development for Belle-II TOP counter

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We present recent R&D results for a multiple-anode MCP-PMT being developed for the Belle-II Time Of Propagation (TOP) counter. This detector is a hybrid cherenkov ring imaging and timing detector for particle identification in the barrel region of the upgraded detector. The Belle-II experiment will operate at high event rates and needs to withstand the correspondingly high background environment. MCP-PMTs have demonstrated excellent single photon timing resolution. However, the lifetime of photocathode is a known issue. Recently, we successfully improved the lifetime of a 25mm square-shape MCP-PMT by a factor of ~ 10 , which is adequate for estimates of the nominal Belle-II background rates in the TOP counter. We have also developed a new MCP-PMT with Hamamatsu that adopts a super-bialkali photocathode. Currently a peak quantum efficiency of 28% for 400nm photons has been achieved.

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