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Performance study of the TOP counter with the 2 GeV/c positron beam at LEPS

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The TOP (Time-Of-Propagation) counter is a novel ring-imaging Cherenkov detector for particle identification in Belle II. Our goal is to identify up to 3 GeV/c kaons and pions with a pion efficiency of 95% and a fake-pion rate of 5% or better. The TOP counter mainly consists of a 2.7 m long quartz radiator bar and 32 micro-channel-plate PMTs. It measures the time of propagation of the Cherenkov photons in the quartz bar with a resolution of 50 ps to reconstruct the Cherenkov "ring" image in the detection time and position plane. A prototype TOP counter which was close to the final design was tested with the 2 GeV/c positron beam at the LEPS beam line in SPring-8, Japan. The test was successful and a beautiful pattern of the Cherenkov image was obtained as expected for the first time. This talk will focus on the results of the beam test, and the principle of the TOP counter will be demonstrated. The results include the number of detected photons per event, the distributions of the time of propagation, the reconstructed velocity of the positron on event by event basis, study for the particle identification based on the Likelihood ratio analysis and comparisons with the Monte Carlo simulation.

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