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# Likelihood analysis methods for the PID system of STCF experiment

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The Super Tau-Charm Facility (STCF) is a proposed electron-positron collider in China, designed to achieve a peak luminosity exceeding $0.5 \times 10^{35}$ cm$^{-2}$s$^{-1}$ and a center-of-mass energy ranging from 2 to 7 GeV. To meet the particle identification (PID) requirements essential for the physics goals of the STCF experiment, a dedicated PID system is proposed to identify $\pi/K$ at momenta up to 2 GeV/c. This system comprises a Ring Imaging Cherenkov (RICH) detector for the barrel region and a time-of-flight detector using internally reflected Cherenkov light (DTOF) for the endcap region. In this report, we introduce likelihood analysis methods to evaluate the PID performance of both the RICH and DTOF detectors within the STCF offline software framework. These methods utilize photon 2D hit maps, with 2D spatial positions for the RICH and time-position patterns for the DTOF, to distinguish particles. Furthermore, we present two distinct analytical approaches tailored for each detector, facilitating the rapid extraction of photon hit patterns for comprehensive likelihood analysis.

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