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Design and performance studies of the electromagnetic calorimeter for STCF

The Super Tau-Charm Facility (STCF) is a future electron-positron collider in China, which is proposed as a unique platform to study tau-charm physics. The peaking luminosity of STCF is beyond $0.5 \times 10^{35} \text{ cm}^{-2} \cdot \text{s}^{-1}$, and the center-of-mass energy range is $2\sim 7 \text{ GeV}$. The high luminosity will pose a great challenge to the radiation tolerance, event pileup and background suppression of electromagnetic calorimeter (EMC).

We will present the conceptual design of EMC, which is based on pure CsI crystals with avalanche photodiodes used as photodetectors. A geometric model design for EMC consisting of 8670 pure CsI crystals with defocus operation will be presented. Based on GEANT4, the performance of EMC is simulated in detail. We will present a summary of the results of the performance simulation, as well as introduce the software framework and reconstruction algorithm. The waveform fitting method was used to reduce the influence of MHz rate background on signal measurement. The results show that after considering several main factors, the energy resolution of the EMC can achieve 2.5% @1 GeV. In addition, the time response of the EMC also will be introduced.

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