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Expected performance of the ALPIDE pixel layers in ALICE Focal

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The ALICE Forward Calorimeter (FoCal), to be installed during LS3 for Run 4, targets precision measurements of direct photons at forward rapidity and thus constrains gluon distributions in protons and nuclei. The expected performance of the electromagnetic section (FoCal-E) is assessed with SystemC models of ALPIDE-based pixel layers and SPS H2 beam data. In these studies, occupancy and BUSY-violation behaviour of the innermost chips are examined together with data-rate margins. Beam tests show that back-bias voltages reduce pixel occupancy by shrinking cluster size. Simulations further evaluate two mitigation options: periodic pixel masking (grid masking) and a pad-layer-driven regional trigger. Both approaches suppress BUSY violations and help maintain readout efficiency at high instantaneous rates. The results indicate that FoCal-E can support precision forward-photon measurements in Run 4.

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