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Background studies for a soft-photon measurement with the Forward Conversion Tracker in ALICE 3

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We propose to construct a forward conversion tracker at the LHC to measure photons of a few MeV in transverse momentum, so called ultra-soft photons, which have the potential to resolve the long standing "soft-photon puzzle": Several experiments have observed an excess of ultra-soft photon production with respect to the expected yield from Low's theorem, which is very fundamentally relating ultra-soft photon production from inner Bremsstrahlung and the spectrum of charged hadrons.

It is proposed to include a Forward Conversion Tracker (FCT) in ALICE 3, the next-generation heavy-ion collision experiment proposed for Run 5 and 6 at the LHC, to measure ultra-soft photons at forward rapidities. The dominant background in this measurement, decay photons and external Bremsstrahlung from detector-material interaction, has been investigated and compared to the signal expectation derived from Low's theorem. This is achieved by simulations including the implementation of the proposed ALICE 3 detector geometry, with the beam pipe, barrel tracking layers, and forward disks of the experiment, in a GEANT4 setup. Pp collisions at 13 TeV are simulated with PYTHIA and the produced particles are propagated through the detector system. Aiming at a significant soft-photon measurement, several background-suppression capabilities have been explored: Major improvements were achieved by the rejection of events with an electron or positron in the η - range of the FCT and by reducing the material budget in optimising the shape of the beam pipe.

This poster will present the current status of the simulation and the background studies for a soft-photon measurement with the ALICE 3-FCT.

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