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Femtoscopy of the proton-proton collisions at the LHC with pion-pion Bose-Einstein correlations in ALICE

We report on the results of identical pion femtoscopy of the pp collisions at the LHC with the Bose-Einstein correlations. We present the final analysis of the ALICE pp datasets at sqrt{s}= 0.9 TeV and 7 TeV and the preliminary results for sqrt{s}=2.76 TeV.

Detailed pion femtoscopy studies in heavy-ion collisions have shown
that emission region sizes ("HBT radii") decrease with increasing pair momentum, which is understood as a manifestation of the collective behavior of matter. 3D radii were also found to universally scale with event multiplicity. In pp collisions at sqer{s} = 7 and 2.76 TeV one measures multiplicities which are comparable with those registered in peripheral Au-Au and Cu-Cu collisions at RHIC, so direct comparisons and tests of scaling laws are now possible.

We show the results of double-differential 3D pion Bose-Einstein femtoscopic analysis, as a function of multiplicity and pair momentum. The results for three collision energies are compared to results obtained in the heavy-ion collisions at similar multiplicity and pp collisions at lower energy. We identify the relevant scaling variables for the femtoscopic radii and discuss the similarities and differences to results from heavy-ions. The observed trends give insight into the soft particle production mechanism in pp collisions and suggest that a self-interacting collective system may be created in sufficiently high multiplicity events.

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