

Femtoscopy of PbPb and pp collisions at the LHC with the ALICE experiment

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We report on the results of femtoscopic analysis of Pb-Pb collisions at $\sqrt{s_{NN}} = 2.76$ TeV with identical pions and pp collisions at $\sqrt{s} = 0.9, 2.76$ and 7 TeV with identical pions and kaons.

Detailed femtoscopy studies in heavy-ion collisions at SPS and RHIC 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. The trend was predicted to persist at the LHC. The data from Pb-Pb collisions confirm the existence of a flowing medium and provide strict constraints on the dynamical models. Similar analysis is carried out for pp collisions for pions and kaons and qualitative similarities to heavy-ion data are seen, especially in collisions producing large number of particles. The observed trends give insight into the soft particle production mechanism in pp collisions.

3D radii were also found to universally scale with event multiplicity in heavy-ion collisions. We extend the range of multiplicities both upwards with the Pb-Pb data and downwards with the pp data to test the scaling in new areas. In particular the high multiplicity pp collisions reach particle densities comparable to the ones measured in peripheral Cu-Cu and Au-Au collisions at RHIC. This allows for the first time to directly compare freeze-out sizes for systems with very different initial states.

Presenter: KISIEL, Adam (CERN)

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