

MPD collaboration and North-Osetian State University (NOSU)

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Proposal of NOSU for MPD collaboration

- Study of the Bose-Einstein correlations for two, three- and four-pions study with data in pp, p-Au, and Au-Au collisions at the NICA energy range.
- Compare four-pion correlations to the expectation derived from two- and three-pion measurements.
- Such a comparison will provide a information of coherent pion emission in nuclei-nucleus interactions.
- New signature of the phase space transition !

Why is interesting:

- The precise shape of the freeze-out space-time distribution is unknown so, the corresponding functional form of the correlation function in momentum space is also unknown and should be investigated with different Monte-Carlo models of nuclei-nucleus interactions and experimentally by MPD experiment at NICA project.
- These investigations could require some geometry optimization of the existed detectors in the experiment or including new specific detectors.

Status of search High order BE correlation

- Observation 3-pion correlation with data of DELPHI experiment at LEP.
- Confirmation of observation by L3 experiment at LEP
- Study of 3- 4- pions correlations by ALICE experiment at LHC
- Study of 3-pion BE correlation by PHENIX experiment at RHIC

References:

- Observation of short range three-particle correlations in $e+e-$ annihilations at LEP energies DELPHI Collaboration, Phys.Lett. B355(1995) 415-424
- Measurement of Genuine Three-Particle Bose-Einstein Correlations in Hadronic Z Decay, L3 Collaboration, arxiv:hep-ex/0206051v1
- . Multipion Bose-Einstein correlations in pp, p-Pb, and Pb-Pb collisions at the LHC, ALICE Collaboration, arxiv:1512.08902v2
- PHENIX results on three-particle Bose-Einstein correlations in $\sqrt{s_{NN}} = 200$ GeV Au+Au collisions, Tamás Novák for the PHENIX Collaboration , arxiv:1801.03544v1

Alice results for 3- and 4 pions correlation

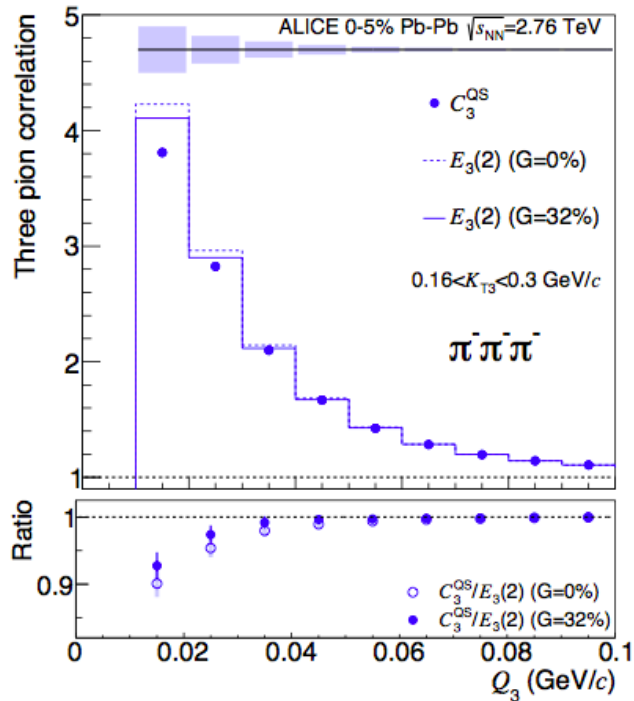


Fig. 8: Same-charge three-pion full (C_3^{QS}) correlations versus Q_3 . Measured and expected correlations of the 1st type are shown. Dashed and solid block histograms show the $G=0$ and $G=32\%$ expected correlations, respectively. The other details are the same as in Fig. 7.

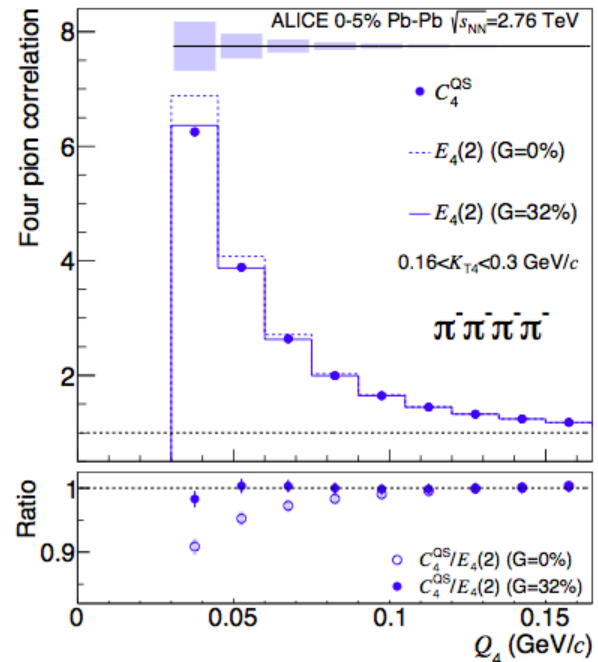


Fig. 7: Same-charge four-pion full (C_4^{QS}) correlations versus Q_4 . Measured and expected correlations of the 1st type are shown. Dashed and solid block histograms show the $G=0$ and $G=32\%$ expected correlations, respectively. Systematic uncertainties are shown at the top. The bottom panel shows the ratio of measured to the expected C_4^{QS} . The systematic uncertainties on the ratio are shown with a shaded blue band ($G=0$) and with a thick blue line ($G=32\%$).

PHENIX results for 3 particle BE correlation

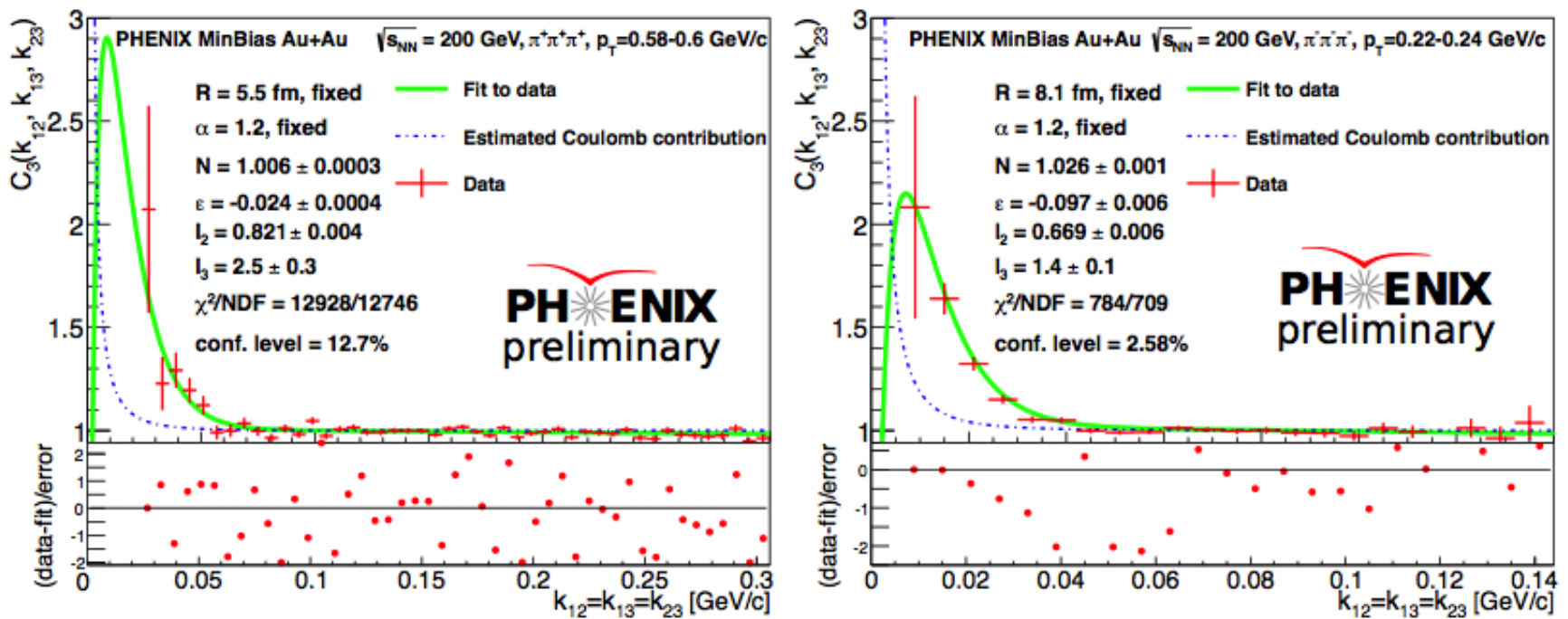


Figure 1. Diagonal visualization of the three-particle Bose-Einstein correlation functions C_3 with the results of fits.

Man power from NOSU for MPD collaboration

- Group are the 5 persons: physicist, 4 PhD students,
- Starting working with optimization of geometry of MPD detector
- Starting to study high order BE correlation with MC
- + participations in hardware development

Participation in MPD

- During of summer student program one of PhD student start working with optimization of geometry of MPD
- Started to study the high order BEC with MC PYTHIA 8.1 were are the parameters for tuning of data for BE correlation, which could be tune.

Opening of “Information Center of JINR in south Russia” in NOSU



We will be glad to join MPD collaboration
THANKS FOR ATTENTION