Study of $K_s^0 - K_s^0$ correlation functions in 158A·GeV Pb+Pb central collisions

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Two-particle correlation function[1] is one of the most important tools in studying the collision dynamics for heavy ion physics.[2] Information on the space-time evolution of the collision is inferred by analyzing the correlation functions.[3] Here, we report the first analysis of the two neutral Kaon ($K_s^0 - K_s^0$) correlation functions in high energy heavy ion collisions. There are several advantages to study K_s^0 correlation functions[4]: (i) The dynamic origin of Kaons is much cleaner than that of pions. For example, the resonance decay contribution is smaller for Kaons than for pions; (ii) In a hadron gas, the interaction cross sections of Kaons is smaller than that of pions. With less final state interaction, the earlier stage information may obtained from study the K_s^0 HBT effect; (iii) There is no Coulomb interaction which modifies the correlation function.

The experimental correlation function C_2 is defined as:

$$C_2(q_{inv}) = \frac{N_{tr}(q_{inv})}{N_{bk}(q_{inv})}$$

where $q_{inv} = \sqrt{-(p_1^\mu - p_2^\mu)^2}$ is the invariant momentum difference. N_{tr} is the true two-particle distribution constructed from particles from the same event and N_{bk} is the background two-particle distribution that is obtained by mixing particles from different events.

Footnotes and References

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[1] For two identical Bosons, it is often called the HBT effect.

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[3] S. Pratt, Phys. Rev. Lett. **53**, 1219(1984); U. Heinz, K.S. Lee, and M.J. Rhoades-Brown, Phys. Rev. Lett., **58**, 2292(1987).

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The NA49 is a large acceptance TPC experiment which is particularly suitable for K_s^0 reconstruction[5]. The data were taken with a special experimental configuration with the target mounted outside the magnetic field.[6] Approximately, 46k central events were used in this analysis. After optimization of the background and kinetic cuts, the preliminary correlation function as a function of the q_{inv} is shown in figure 1. As shown in the figure, about 1000 true Kaon pairs were used for the correlation function.

Although the C_2 shows some enhancement at $q_{inv} \leq 200$MeV/c, the statistics for the Kaon correlation function are not sufficient for physics interpretation. We are currently analyzing a much larger data set. We are also working on the simulations to understand better the reconstruction efficiency and cuts.

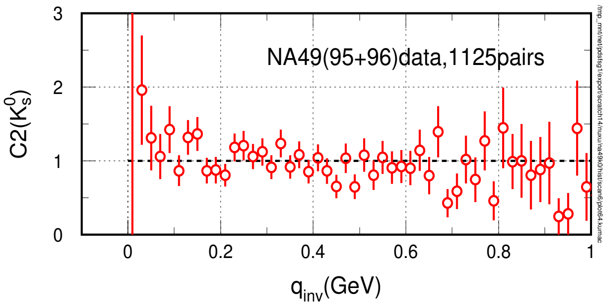

Figure 1: *The NA49 preliminary $K_s^0 - K_s^0$ correlation function C_2 as a function of the q_{inv}. The total number of the true and background pairs is about 1k and 600k, respectively.*

Footnotes and References

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[6] G. Odyniec *et al.*, NA49 Collaboration, International Symposium on Strangeness in Quark Matter 1997, Santorini, Greece, April 14-18, 1997. LBNL-40422.