Measurement of Invariant Mass Spectra of Vector Meson Decaying in Nuclear Matter

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It is a well established argument that 99% of hadron mass is generated due to the spontaneous breaking of the symmetry by the strong force. However, only few experimental evidences exist to support this concept. As possible signatures for such a broken symmetry, the modification of hadron mass and decay width in a nuclear medium is theoretically predicted as a consequence of the restoration of the broken symmetry. Thus experimental observation of such phenomena has become one of the most interesting topics in hadron physics today.

We have been performing an experiment at the KEK proton synchrotron to observe the decay of ϕ meson in a nuclear target, to investigate the modification of hadron properties at normal nuclear density. The experiment is to measure the invariant mass spectra of $\phi \to e^+e^-$ and $\phi \to K^+K^-$ decay modes simultaneously. We also measure branching ratios in the two decay modes, which are sensitive to the mass modification of ϕ mesons and kaons.

From the analysis of the 1998-1999 data, we have published the result showing the significant enhancement below the ω mass peak in the invariant mass spectrum of e^+e^- pairs for the copper target, which is attributed to the mass modification effect in nuclear matter[1]. We have continued the data acquisition until March 2002. At this conference, we will present our new results based on the statistics 5 times larger than the previous publication. We would like to discuss our results along the line of chiral symmetry in dense matter.

References

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