Observation of in-media modification of □/□ meson at KEK-PS

KEK-PS E325

We have been measuring invariant mass spectra of electron-positron pairs and K^+K^- pairs in 12 GeV p+A interactions at the KEK-PS EP1-B line. The aim of the experiment is to detect in-medium modification of vector mesons, which is theoretically predicted as a consequence of partially restored chiral-symmetry expected in dense matter. Recently we have published our first significant results (Phys. Rev. Lett. volume 86 number 22 5019-5022, 2001), in which we have reported a signature of in-media modification of □/□ mesons. In the e^+e^- mass spectrum for the copper target the signal has appeared as statistically significant excess below the □ peak over the known physics processes (see the figure below). Although the theoretical interpretation is not conclusive yet, the data show that the spectral function of vector meson is modified in a nucleus. We like to emphasize that this is the first successful observation of leptonic decay of vector meson in normal nuclear matter.

The reported spectra are obtained from the data taken in 1998. The data taken in 1999 and 2000 are currently being analyzed and further data accumulation is scheduled in 2001 and later. Data with larger statistic, with which modification of □ can also be addresses, will be reported soon.

Figure: Invariant mass spectra of e^+e^- pairs; a) for the light targets (C and CH2) and b) for the heavy target (Cu). The solid lines show the best fits obtained as a cocktail of known hadronic sources and the combinatorial background. The dotted lines indicate the contributions from free decays of □, □ and □. The dashed lines are decays □ → □$^0e^+e^-$ and the dot-dashed lines are the combinatorial background.