

Medium modification of vector mesons in 12-GeV p+A reactions at KEK-PS

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We present the experimental results which show ρ , ω and ϕ meson mass modification at normal nuclear density. The aim of our experiment, KEK-PS E325, is to detect possible in-medium modification of vector mesons via the reaction $12\text{GeV}/c\ p + A \rightarrow \rho, \omega, \phi + X \rightarrow e^+e^- + X'$. Modification of mass spectral function of vector meson, even at normal nuclear density, have been suggested by many theories as a precursor of the QCD chiral phase transition.

We used C and Cu targets as small and large target nuclei. In the invariant mass spectra of e^+e^- pairs, we observed an excess over the known hadronic sources on the low-mass side of the ω meson peak. [1] The 95 % C.L. allowed parameter regions were obtained as $\rho/\omega < 0.15$ and $\rho/\omega < 0.31$ for C and Cu targets, respectively. These values are much smaller than one, as was previously measured in pp interactions at the same energy. A possible explanation of the small ρ/ω is that the most of the ρ decay inside the nuclei due to their short lifetime, therefore the ρ with the vacuum shape is highly suppressed, and the modified ρ contributes to the excess.

As for ϕ meson, in the high $\beta\gamma$ region, both results obtained from C and Cu targets were consistent with the simulation shape which included no spectral modification. On the other hand, in the low $\beta\gamma$ region, significant excess on the low-mass side of the ϕ meson peak was observed in the Cu data. [2] Since slowly moving mesons in a larger nucleus have a larger probability of decaying inside a nucleus, this results suggest ϕ meson modification in a nucleus.

[1] M. Naruki *et al.*, Phys. Rev. Lett. **96**, 092301(2006)

[2] R. Muto *et al.*, nucl-ex/0511019

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