

Isospin dependence of the η' meson production in the nucleon–nucleon collisions.

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According to the quark model, η and η' mesons can be described as the mixture of the singlet ($\eta_1 = \frac{1}{\sqrt{3}}(u\bar{u} + d\bar{d} + s\bar{s})$) and octet ($\eta_8 = \frac{1}{\sqrt{6}}(u\bar{u} + d\bar{d} - 2s\bar{s})$) states of the SU(3) - flavour pseudoscalar meson nonet. A small mixing angle ($\Theta = -15.5^\circ$) implies that the masses of η and η' mesons should be almost equal. However, the empirical value of these masses differ by more than the factor of two, moreover the mass of the η' does not fit utterly to the SU(3) scheme.

Similarly, though the almost the same quark-antiquark content, the total cross section for the creation of these mesons close to the kinematical thresholds of the $pp \rightarrow ppX$ reaction differs significantly. In particular the total cross sections for the $pp \rightarrow pp\eta'$ reaction close to the threshold are by about a factor of fifty smaller than the cross sections for the $pp \rightarrow pp\eta$ reaction.

Using the COSY-11 detection setup we intend to determine whether this difference will also be so significant in the case of the production of these mesons in the proton-neutron scattering. Additionally the comparison of the $pp \rightarrow pp\eta'$ and $pn \rightarrow pn\eta'$ total cross sections will allow to learn about the production of the η' meson in the channels of isospin $I = 0$ and $I = 1$ and to investigate aspects of the gluonium component of the η' meson.

The measurement of the quasi-free $pn \rightarrow pnX$ processes is conducted using a proton beam and a deuteron cluster target. The registration of all outgoing nucleons from the $pd \rightarrow p_{sp}pnX$ reaction and application of the missing mass technique allow to identify events with the creation of the meson under investigation.

The presentation will be focused on the explanation of the method of the measurement of the quasi-free $pn \rightarrow pn\eta'$ reaction.

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