

Study of the gluon content of the eta-prime meson via its close-to-threshold production in the nucleon-nucleon collisions

Paweł Moskal^{1,2} for the COSY-11 collaboration

¹ Jagellonian University, Cracow, Poland

² Forschungszentrum Jülich, Germany

The most remarkable feature – in the frame of the quark model – distinguishing the η' meson from all other pseudoscalar and vector ground state mesons, is the fact, that the η' is predominantly a flavour-singlet combination of quark-antiquark pairs and therefore can mix with purely gluonic states.

Therefore, additionally to the mechanisms associated with meson exchanges it is possible that the η' meson is created from excited glue in the interaction region of the colliding nucleons, which couple to the η' meson directly via its gluonic component or through its SU(3)-flavour-singlet admixture. The production through the colour-singlet object as suggested in reference [1] is isospin independent and should lead to the same production yield of the η' meson in the $pn \rightarrow pn \text{ gluons} \rightarrow pn\eta'$ and $pp \rightarrow pp \text{ gluons} \rightarrow pp\eta'$ reactions after correcting for the final and initial state interaction between the nucleons.

In this presentation we will argue that a comparison of the close-to-threshold total cross sections for the η' meson production in both the $pp \rightarrow pp\eta'$ and $pn \rightarrow pn\eta'$ reactions should provide insight into the flavour-singlet (perhaps also into gluonium) content of the η' meson and the relevance of quark-gluon or hadronic degrees of freedom in the creation process [2]. We will present experimental technique used for the measurements of the η and η' meson production in free proton-proton and quasi-free proton-neutron collisions. Tentative results from the measurements carried out at the COSY-11 facility using a beam of stochastically cooled protons and the deuteron cluster target will be presented and discussed.

References:

[1] S. D. Bass, Phys. Lett. **B 463** (1999) 286. [e-Print Archive: hep-ph/9907373]

[2] P. Moskal, e-Print Archive: hep-ph/0408162

Contact e-mail: p.moskal@fz-juelich.de

Web page: <http://ikpe1101.ikp.kfa-juelich.de>