

Proposal and Beam request

For Lab. use

Exp. No.:	Session No.
	35

Title of Experiment

**Measurement of the cross section and analyzing
power of the $p_{(pol)}p \rightarrow (pp)_s\pi^0$ reaction**

Collaborators: ANKE Collaboration

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No support from the LSF program of the EC is requested

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Total number of particles and type of beam (p,d,polarization) polarized protons (not less 50 % !)	Momentum range (MeV/c) 883, 1090, 1219, 1343	Intensity or internal reaction rate (particles per second)	
		minimum needed 3×10^9	maximum useful $> 10^{10}$
Type of target ANKE hydrogen cluster target	Safety aspects (if any)	Earliest date of installation September , 2008	Total beam time (weeks) 1 week

Summary of experiment:

At the PAC meeting #31 proposal 158, "Measurement of the cross section and analysing power of the $p_{(\text{pol})}p \rightarrow (pp)_s\pi^0$ reaction", has been approved. The measurement of this reaction in the 0.35 - 0.8 GeV energy range is of great interest because, as stated in the ANKE SPIN proposal [1], at 0.35 GeV it would provide a valuable test of the ChPT theory while at higher energies the phenomenological model [2], the only one existing for this process in this energy range, could be tested. More details can be found in the original proposal [3].

At the PAC meeting #33 one week of beam time was allocated for proposal 158, which took place in October/November 2007. The main goal of the beam time was the measurement of polarization observable A_y including its energy and angular dependences. This aim has not been achieved due to a failure of the polarized proton beam. (The polarized beam was available only a few hours with low intensity of around 5×10^8 particles (several times less than expected) and a beam polarization of about 40%. After this the polarization source failed and a polarized proton beam was not provided anymore till the end of the beam time.)

For this reason the program of the beam time was reconsidered and we have decided to conduct measurements of the same reaction at 0.35, 0.5, 0.55, 1.7 and 2.4 GeV with an unpolarized beam. This allows us to observe the energy dependence of the differential cross section of the reaction $pp \rightarrow (pp)_s\pi^0$ for the first time in a wide energy range from 0.35 up to 2.85 GeV using in analysis at the highest energy the available ANKE data obtained in other beam times. These results will be supplementary to our previous measurements of this process [4,5].

In conclusion, we were not able to study the process $p_{(\text{pol})}p \rightarrow (pp)_s\pi^0$ with a polarized beam, which was the main goal of the proposal 158. Therefore, we ask for allocation of **ONE week** of beam time with a polarized proton beam and ANKE cluster jet target.

References:

- [1] A.Kacharava, F.Rathmann, and C.Wilkin, 'Spin Physics from COSY to FAIR', COSY proposal #152 (2005), [arXiv:nucl-ex/0511028]
- [2] J.A .Niskanen. Phys. Lett. B 642 (2006) 34
- [3] A. Kulikov, proposal #158 (2007); {www.fz-juelich.de/ikp/anke/en/proposals.shtml}.
- [4] S. Dymov et al. Phys. Lett. B 635 (2006) 270
- [5] V. Kurbatov et al. Phys. Lett. B 661 (2008) 22