# Nuclear structure studies with low energy antiprotons

S. Wycech
*Soltan Institute for Nuclear Studies, Warsaw, Poland*

## Abstract

The nuclear capture of stopped $\bar{p}$ has been used to study the neutron density distributions in nuclei. Three well established methods were used for this purpose: the atomic X-rays measurements [1,2], radiochemical detection of residual nuclei [2] and the detection of charged $\pi$ mesons emitted in the $\bar{p}N$annihilation [3]. The extension of the last method to study trapped, unstable nuclei is proposed by the RIKEN group [4]. An alternative method of $\bar{p}$ capture in flight is proposed by the AIC collaboration [5].

The X-ray measurements offer an advantage of well defined initial states, but cannot distinguish the proton contribution from the neutron one. The other methods can do that, but require additional data: the strengths of the $\bar{p}p$ and $\bar{p}n$ absorption rates and the knowledge of initial capture states.

Few problems that arise in the analysis of the existing and the forthcoming data will be discussed. All, these capture modes test neutron density distributions in different regions of nuclei and yield complementary information on the $R_{ms}$ and higher moments of the neutron density profiles. In particular the radiochemistry tests the highest and the in flight experiments will test the lowest of the available moments. Some advantages and difficulties of these experimental methods are indicated.

The best ratio of $\bar{p}p$ and $\bar{p}n$ absorption rates will be extracted from antiprotonic atoms in particular the $\bar{p}D$, $\bar{p}He$ and CERN chamber experiments. The comparison with theoretical $\bar{N}N$ interaction models will be made.

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