

Accepted Manuscript

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PII: S0168-9002(17)30968-3
DOI: <http://dx.doi.org/10.1016/j.nima.2017.09.013>
Reference: NIMA 60092

To appear in: *Nuclear Inst. and Methods in Physics Research, A*

Received date: 10 March 2017
Revised date: 1 September 2017
Accepted date: 5 September 2017

Please cite this article as: J. Bradt, D. Bazin, F. Abu-Nimeh, T. Ahn, Y. Ayyad, S. Beceiro Novo, L. Carpenter, M. Cortesi, M.P. Kuchera, W.G. Lynch, W. Mittig, S. Rost, N. Watwood, J. Yurkon, Commissioning of the active-target time projection chamber, *Nuclear Inst. and Methods in Physics Research, A* (2017), <http://dx.doi.org/10.1016/j.nima.2017.09.013>

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Commissioning of the Active-Target Time Projection Chamber

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Abstract

The Active-Target Time Projection Chamber (AT-TPC) was recently built and commissioned at the National Superconducting Cyclotron Laboratory at Michigan State University. This gas-filled detector uses an active-target design where the gas acts as both the tracking medium and the reaction target. Operating inside a 2 T solenoidal magnetic field, the AT-TPC records charged particle tracks that can be reconstructed to very good energy and angular resolutions. The near- 4π solid angle coverage and thick target of the detector are well-suited to experiments with low secondary beam intensities. In this paper, the design and instrumentation of the AT-TPC are described along with the methods used to analyze the data it produces. A simulation of the detector's performance and some results from its commissioning with a radioactive ^{46}Ar beam are also presented.

Keywords: time projection chamber, active target, micromegas, digital electronics

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