

DAMOP13-2013-000310

Abstract for an Invited Paper
for the DAMOP13 Meeting of
the American Physical Society

High resolution X-ray emission measurements toward understanding low energy charge exchange important to astrophysics¹

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From the discovery of X-ray emission from Comet Hyakutake to the more detailed observations provided by Chandra, XMM-Newton, Suzaku, etc., charge exchange (CX) is of increasing importance for NASA missions. The University of Wisconsin and Goddard Space Center X-ray micro calorimeter which is used in sounding rocket observations of the diffuse X-ray background, has a dedicated beam line at ORNL and has measured X-ray emission due to CX from a variety of solar wind ions interacting with He, Kr and H₂ at typical solar wind velocities. A proposed modification to the X-ray calorimeter and cryogenic shields will allow for the first merged-beam measurements with atomic H, the remaining elusive benchmark needed for CX modeling of a variety of astrophysical objects. Measured line ratios for the gas targets are compared to a variety of available theoretical predictions. Research supported by the NASA Solar & Heliospheric Physics Program NNH07ZDA001N, the Office of Fusion Energy Sciences and Division of Chemical Sciences, Geosciences, and Biosciences, the Office of Basic Energy Sciences of the US Department of Energy. VA is supported by the National Science Foundation through Grant No. PHY-106887.

¹In collaboration with I. N. Draganic, D. McCammon, X. DeFay, K. Morgan, D. Wulf, V. Andrianarijaona, S. L. Ramano, C. I. Guillen, A. K. Vasantachart, A. Galindo-Uribarri, F. S. Carcoba, D. J. Nader, D. Seely, M. Fogle, P. C. Stancil and D. R. Schultz