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**Production of Excited Atomic Hydrogen and Deuterium from $H_2$, $D_2$ and HD Photodissociation** J.R. MACHACEK, University of Nebraksa-Lincoln, V.M. ANDRIANARIJAONA, Pacific Union College, J.E. FURST, University of Newcastle-Ourimbah, T.J. GAY, University of Nebraska-Lincoln, A.L.D. KILCOYNE, LBNL, A.L. LANDERS, Auburn University, K.W. MCLAUGHLIN, Loras College — We have measured the production of Ly$\alpha$ and H$\alpha$ fluorescence from atomic H and D resulting from the photodissociation of $H_2$, $D_2$ and HD by linearly-polarized photons with energies between 20 and 65 eV. In this energy range, excited photofragments result primarily from the production of doubly-excited molecular species which promptly autoionize or dissociate into two neutrals. Comparison between the relative cross sections of $H_2$ and $D_2$ and the available theory show only qualitative agreement. We will discuss the various systematic effects which affect this and other types of synchrotron-based measurements in this energy range. Support provided by the NSF (Grant PHY-0653379), DOE (LBNL/ALS) and ANSTO (Access to Major Research Facilities Programme).

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