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Overview of the NIST research program on atomic data and modeling for fusion

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Development of critically evaluated data sets for atomic parameters has long been a major part of the research program at the National Institute of Standards and Technology (NIST). Over the last decade NIST researchers and their collaborators created recommended sets of data for a number of fusion-related elements including, e.g., Be, Ar, Fe, Mo, and W. As a result, for example, the number of spectral lines in the most comprehensive of NIST atomic databases, the Atomic Spectra Database (ASD), increased by about 20%. The NIST Electron Beam Ion Trap (EBIT) is routinely used to accurately determine spectral characteristics of highly charged ions of mid- and high-Z elements. Also, extensive sets of recommended cross sections for electron-impact excitation and ionization (for, e.g., Be I and Be II) as well as for charge exchange (CX) between energetic neutral beams and highly-charged ions of tungsten were reported. Furthermore, the spectra of multiply-charged W due to CX interactions in the ITER core plasma were determined using large-scale collisional-radiative models.

In this presentation we will describe the major directions and components of the NIST research program on critical evaluation of spectroscopic data for fusion, measurement and analysis of extreme ultraviolet and x-ray spectra from heavy multiply charged ions, and collisional-radiative modeling of relevance to fusion.

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