Abstract for Joint ICTP-IAEA School on Atomic and Molecular Spectroscopy in Plasmas

Title: Spectrum of Ni V in the Vacuum Ultraviolet

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I will be presenting our recent assessment of Fe V and Ni V in the VUV. This presentation will demonstrate the major improvements that were made to the atomic data available for Ni V. Our work contains 97 remeasured Fe V wavelengths (1200 Å to 1600 Å) and 123 remeasured Ni V wavelengths (1200 Å to 1400 Å) with uncertainties of approximately 2 mÅ. An additional 67 remeasured Fe V wavelengths and 72 remeasured Ni V wavelengths with uncertainties greater than 2 mÅ are also included. These new measurements, conducted at the National Institute of Standards and Technology, reduce the uncertainties of Ni V wavelengths by roughly a factor of four in most cases. A systematic calibration error is also identified in the previous Ni V wavelengths and is corrected in our work. In addition to new wavelength data, we have also conducted a radiometric calibration of our spectra to provide calibrated intensity values for our Ni V wavelengths. Additionally, a new energy level optimization, based on our new measurements of Ni V, is presented that includes Ni V level values as well as Ritz wavelengths.

Our work improves upon the available data used for observations of quadruply ionized nickel in white dwarf stars. In particular this compilation is targeted towards observations of the G191-B2B white dwarf spectrum that has been used to test for variations in the fine structure constant, α, in the presence of strong gravitational fields (Berengut et al. 2013)*. The laboratory wavelengths for these ions were thought to be the cause of inconsistent conclusions regarding the variation limit of α as observed through the white dwarf spectrum. These inconsistencies can now be addressed with our improved laboratory data.

*Limits on the Dependence of the Fine-Structure Constant on Gravitational Potential from White-Dwarf Spectra
J. C. Berengut et al.
Phys. Rev. Lett. **111**, 010801 – Published 3 July 2013