Wavelengths and Oscillator Strengths for Space Astronomy

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Over a period of more than a decade the Atomic Spectroscopy Group at NIST has carried out laboratory research to support the observing program of the Hubble Space Telescope. Our measurements of the spectral lines emitted by a Pt/Ne hollow cathode lamp have been used for wavelength calibration of the Goddard High Resolution Spectrograph and will continue in use for calibration of the Space Telescope Imaging Spectrograph. Our comprehensive atlas [1] covering the spectrum from 1100 to 4000 Å, which contains accurate wavelengths and photometric scans, is now accessible at http://physics.nist.gov.

Recently we have studied species needed for interpretation of HST spectra of chemically peculiar stars. Our spectral analyses provide wavelengths and oscillator strengths for modelling stellar atmospheres, and our detailed studies of particular spectral lines are used to determine elemental and isotopic abundances.

We are currently completing extensive new analyses of Hg II and III, which are of special interest because of the high abundance of Hg in chi Lupi. Results of this work are used in a current analysis of Hg in chi Lupi and HR7775 [2]. Our wavelengths for Zr II and III support the identification of Zr in chi Lupi [3]. We have also presented a full analysis for Zr III [4]. Members of our Group have calculated oscillator strengths for Gd III and Eu III and made the first analysis of Dy III [5].

For determination of isotopic abundances in chi Lupi we have made observations of selected lines of Hg III with separated isotopes [6]. These measurements helped to prove that all Hg on chi Lupi is the heaviest isotope: ^{204}Hg [3]. In connection with the recent identification of Bi in HR7775 [7] we made new measurements of Bi I, II, and III in the far UV. Our measurement of the 1553-Å line of Pb III established the identification of Pb in chi Lupi, and separated isotope measurements with ^{204}Pb and ^{207}Pb showed that the Pb on chi Lupi is predominantly isotope 207 [8].

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Acknowledgments:

This work was supported in part by the National Aeronautics and Space Administration.