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Astrophysical Observations of Oxygen Lines Using High-Resolution X-ray Spectra

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Oxygen has importance in astrophysics as the most cosmically abundant element with $Z > 2$. In the interstellar medium (the material between the stars in the galaxy; ISM), it is predominately found in atomic form, mostly in its neutral stage (90%), with some fraction being singly-ionized (10%) and doubly-ionized ($< 1\%$). This atomic oxygen produces significant absorption in the X-ray band, particularly in the form of the K-edge and the K-alpha absorption resonances of O I, O II, and O III in the 21-24 A spectral region. We have carried out a systematic study of the oxygen absorption features in the local ISM by analyzing all the high statistical quality data available from the grating instruments on the Chandra and XMM-Newton X-ray observatories. We find a clear discrepancy in the centroid wavelengths of the absorption features observed in the astrophysical data when compared with the latest laboratory measurements. In this talk, we present our current efforts to assess the absolute wavelength calibration of the instruments onboard Chandra. We discuss the need for accuracy in the atomic data for inner-shell transitions, and how accurate models for atomic absorption can contribute to understanding the ISM.

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