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High-resolution spectroscopy of the low-mass X-ray binary EXO 0748−67

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Abstract. We present initial results from observations of the low-mass X-ray binary EXO 0748−67 with the Reflection Grating Spectrometer on board the *XMM-Newton* Observatory. The spectra exhibit discrete structure due to absorption and emission from ionized neon, oxygen, and nitrogen. We use the quantitative constraints imposed by the spectral features to develop an empirical model of the circumsource material. This consists of a thickened accretion disk with emission and absorption in the plasma orbiting high above the binary plane. This model presents challenges to current theories of accretion in X-ray binary systems.

Key words. stars:individual:EXO 0748−67 – binaries: eclipsing – X-rays:stars

1. Introduction

X-ray spectroscopic observations should provide a useful probe of the accretion processes in low-mass X-ray binaries (LMXB's). The continuum emission from the bright central source is reprocessed as the photons are absorbed and re-emitted in the surrounding material. The details of the resulting X-ray spectra are extremely sensitive to the physical conditions in the plasma and therefore provide an excellent way to constrain the circumstellar environment

X-ray bursts confirmed that the compact object is a neutron star (Gottwald et al. 1986). Observations with both *ASCA* (Thomas et al. 1997) and *ROSAT* (Schulz 1999) revealed structure in the soft X-ray spectrum, but the limited spectral resolution of these instruments made it impossible to distinguish whether this was due to absorption or emission features. In the RGS observations that we present below, we find a spectrum that is rich in discrete structure including absorption and emission from ionized oxygen, nitrogen, and neon. We use the available spectral