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A SEARCH FOR SPECTRAL FEATURES IN THE XMM-NEWTON OBSERVATION OF UGC 11763

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We have performed the analysis of the X-ray XMM-Newton spectra of the narrow line Seyfert 1 galaxy UGC 11763 (Mkn 1513). We have studied the EPIC data in the range 0.35-10.0 keV (1.2–35.4 Å) and also the high resolution soft X-ray spectra taken with the Reflection Grating Spectrometers (RGSs) in the range 10–30 Å (0.41–1.2 keV). The principal feature observed in the hard X-ray spectrum is a weak Fe-Kα fluorescence line. The soft X-ray spectra are characterised by absorption features. The most significant of them is the one between 15 and 18 Å (in the rest frame of the object). We have identified this broad absorption with the UTA (unresolved transition array) produced by Fe M-shell transitions which was reported for the first time by Sako et al. (2001), and that is indicative of the presence of absorbing material in the vicinity of the active nucleus.

Fitting simultaneously the EPIC-pn, EPIC-MOS1 and EPIC-MOS2 spectra, we find that the continuum of this object in the 1–10 keV can be described by a power law with an index of about 1.6, which is a typical value for this kind of objects (Piconcelli et al. 2005). The extrapolation of this power law to the 0.35–1.0 keV shows that UGC 11763 presents a soft X-ray excess which can be modelled using a black body component with kT $\sim$ 0.1 keV. This value is in good agreement with those found by Piconcelli et al. (2005). The inclusion of the Fe-Kα fluorescence line (at 6.3 keV) improves the fit. The line found is weak and broad, with an equivalent with of about 200 eV.

To model the whole range 0.35 to 10 keV we use simultaneously the five X-ray spectra obtained by the instruments on board the XMM-Newton satellite: EPIC-pn, EPIC-MOS1, EPIC-MOS2, RGS1 and RGS2. For the EPIC spectra we have used the 0.35–10 keV and for the RGS spectra we have used the 0.41–1.8 keV energy range. The continuum model found using only EPIC spectra provides a fit with a reduce chi-square of 1.35 (with 512 dof). In addition, an inspection of the residuals shows that there are some absorption and emission features in the RGS spectra that are not well fitted by the EPIC continuum model. In particular, there is a prominent absorption around 16 Å that is consistent with the Fe M-shell UTA originated in partially ionised gas in the neighbourhood of the nucleus. We model the absorptions with the photoionisation code PHASE (PHotoionized Absorption Spectral Engine; Krongold et al. 2003), and the narrow emission features with Gaussians. The fits with PHASE show that there is warm material absorbing the X-ray emission of the nuclear source. As in other objects (e.g. Krongold et al. 2005, 2007), this material can be characterised by two different ionising parameters $[U = Q(H)/4\pi r^2 n_{\rm H} c]$. The ionisation parameters of the best fit model are 1.4 and 2.4 with moderate H column densities of 10^{21} and $2.7 \times 10^{21}\,\mathrm{cm}^{-2}$, respectively.

The emission lines identified in the RGS spectra and included as narrow Gaussian components are O VIII-Kα λ 18.97, O VII-Heα $\lambda\lambda$ 21.60, 21.80, 22.10, O VII-Heβ λ 18.63, and Ne IX-Heα $\lambda\lambda$ 13.45, 13.55, 13.70. The line wavelengths are well identified in the fitting process indicating the presence of the lines, but the normalisation of some of them are not well constrained with the signal to noise of the available RGS spectra.

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