**Abstract.** A recently performed XMM-Newton observation of the ULIRG NGC 6240 clearly indicates the presence of an AGN contribution to its X-ray spectrum. In the 5.0 - 7.0 keV energy range there is a clear signature of the fluorescent Fe Kα lines at 6.4, 6.7 and 6.9 keV, respectively. The line strength of the 6.4 keV line cannot be produced by a thermal component. The 0.3 - 10.0 keV spectral energy distribution is characterized by the following components: (I) two hot thermal components (the starburst), (II) one direct component (heavily absorbed; AGN is hidden), (III) one reflection component (the AGN), (IV) three narrow Fe lines. The model parameters for the broad-band spectral energy distribution are consistent with the results of previously works.

1. Introduction

Many if not all high-luminous infrared galaxies (ULIRGs, \( L_{\text{FIR}} \gtrsim 10^{12} L_\odot \)) possess regions hidden by huge amounts of dust. This makes it difficult to ascertain whether this enormous energy output is due to a starburst activity or an accretion process onto a supermassive black hole. One of the best known objects to study this relationship is the nearby ULIRG NGC 6240 (assuming \( H_0 \leq 65 \text{ km s}^{-1} \text{ Mpc}^{-1} \)). Infrared observations favour an energy source dominated by starburst processes, whereas observations in the X-ray range point to an AGN as the central engine (\( L_X \sim 10^{11} L_\odot \)).

2. Spectral analysis

We have analyzed the data of NGC 6240 taken from a 24 ksec observation with XMM-Newton using the EPIC-PN and EPIC-MOS instruments. In order to investigate the Fe line complex around 6.4 keV and the 0.3 - 10.0 keV spectrum as a whole the high sensitivity and therefore the good photon statistics - especially in the 6.4 keV range - in combination with a higher energy resolution enables us to examine this feature in unprecedented detail.

2.1. The Fe Kα line complex

Table 1 summarizes some basic parameters (powerlaw - \( \Gamma \), line energies) of different models (first column) after fitting to the data. The first of the leading
three models includes line profiles with no line width ($\sigma = 0$), whereas each one of the last two models uses a second powerlaw, but with a different number of line profiles. Each model contains a 6.4 keV line as an indication of an AGN contribution. A prove of an Compton-thick AGN has been reported by Vignati et al. (1999) using BeppoSax and by Ikebe et al. (2000) using RXTE. However, the last model seems to have the best statistical acceptance (see Fig. 1, left).

Table 1. Spectral fitting results to the Fe line complex

| Emission lines | powerlaw $\Gamma$ | gaussian lines [in keV] | $\chi^2$/d.o.f. |
|----------------|-------------------|-------------------------|-----------------|
| lines : $\sigma = 0$ | -0.18 | 6.40 (0.01) 6.67 (0.02) 6.98 (0.04) | 38.5/53 |
| lines : $\sigma \neq 0$ | -0.16 | 6.40 (0.02) 6.67 (0.03) 6.97 (0.04) | 38.4/51 |
| lines : 2nd broad | -0.27 | 6.40 (0.03) 6.60 (0.11) 6.66 (0.06) | 43.1/53 |
| Emission lines + powerlaw | -0.18 | 6.40 (0.01) 6.67 (0.02) 6.98 (0.04) | 38.5/53 |
| absorp. edge: | $\Gamma$ | gaussian lines [in keV] | $\chi^2$/d.o.f. |
| po + 2 lines | 0.47 | 6.39 (0.02) 6.65 (0.04) | - 39.7/54 |
| po + 3 lines | 0.47 | 6.40 (0.02) 6.65 (0.04) | 7.05 (0.02) | 39.1/54 |

2.2. Models to the overall X-ray spectrum

The analysis of the spectral data (0.3 – 10.0 keV) indicates at least two models providing an statistically acceptable fit: Each of them contains two thin thermal plasmas ($kT \approx 0.6$ keV and $kT \approx 1.1$ keV), a direct component (absorbed powerlaw with $\Gamma = 1.8$ and $N_H = 2.18 \cdot 10^{24}$ cm$^{-2}$, both fixed) as well as a reflection component (absorbed powerlaw, either reflected from neutral matter or not). Finally, three gaussian lines have been added to the models (neutral + ionized K $\alpha$ and K $\beta$). The right plot of Fig. 1 shows the components of the second model (incl. reflection) and their deviations from the data points.

![Figure 1. The Fe K line complex and the overall spectrum](image.png)

The model parameters for the broad-band spectral energy distribution is consistent with the results previously reported by Iwasawa & Comastri (1998), except for the Fe line complex.

References

Ikebe, Y. et al. 2000, MNRAS, 316, 433
Iwasawa, K. & Comastri A. 1998, MNRAS, 297, 1219
Vignati, P. et al. 1999, A&A, 349, L 57