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MODELING OF THE BROAD BAND X-RAY SPECTRA OF THE SEYFERT 1 MRK 841

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The presence in Mrk 841 of a strong soft excess and a complex iron profile, has been confirmed by repeated XMM-Newton observations. The 0.5–10 keV emission may be entirely explained by the combination of a relativistically blurred photoionized reflection, producing simultaneously the soft excess and the broad iron line, and a neutral, unblurred one, producing the narrow line.

Mrk 841 is a bright Seyfert 1 galaxy showing a large spectral variability, a strong soft excess and a variable complex iron line. It has been observed 5 times by XMM-Newton (Jan. 2001 [OBS 1, 2, 3], Jan. 2005 [OBS 4 divided in 3 parts of 15 ks each], Jul. 2005 [OBS 5]), for a total exposure time of ∼108 ks. A detailed study of these observations is presented in Petrucci et al. (2007).

The 0.5-10 keV count rate decreases by a factor 4 in 4 years while the hardness ratio increases, reaching maximum values during OBS 4. The 3–10 keV count rate shows variations of 60% implying that the 0.5–10 keV count rate variability is dominated by the soft (<3 keV) X-ray variability, at least on long time scale. Smooth soft and hard flux variabilities up to 50% are also visible on tens of ks.

To describe the iron complex, the data require a narrow line in all the observations except for OBS 3 and part 2 of OBS 4 where a broad component is found (Longinotti et al. 2004; Petrucci et al. 2007). The iron line varies in width rather than in flux. The presence of both broad and narrow components is clearly visible during OBS 4. The addition of a second Gaussian line does not improve significantly the fits for all other observations.

The X-ray spectral shape clearly shows a soft excess, also present in a large number of AGN. While its origin is still not clearly understood, an appealing explanation could be blurred reflection from the accretion disc (e.g. Crummy et al. 2006). We thus use a model with the following components: a neutral absorption; a cut-off power law continuum (the high energy cut-off being fixed to 300 keV); a blurred photoionized reflection and a narrow line component if needed. For the blurred reflection, we use the tables of Ross & Fabian (2005) convolved with a Laor profile (kdblur kernel). We obtain very good fits in most of the cases which reproduce well the soft excess and the broad iron line (cf. Figure 1 for part 3 of OBS 4). Except for OBS 3, the addition of a narrow line is always required. The best fits obtained for the 2001 observations also agree with the simultaneous BeppoSAX data which is quite encouraging.

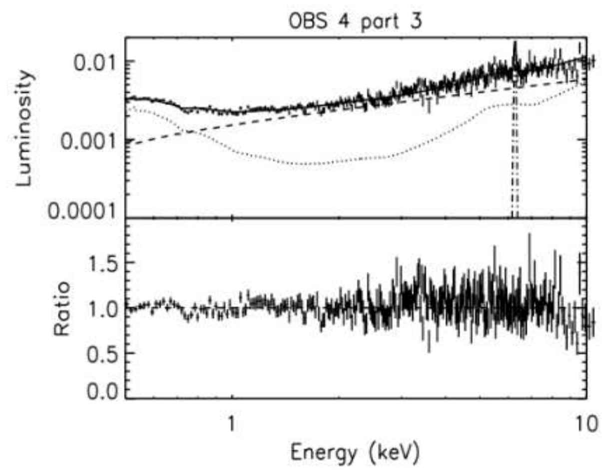

Fig. 1. Best fit (OBS 4, part3) obtained with the blurred ionized reflection + WA (solid line): cut-off power law (dashed line), blurred ionized reflection (dotted line) and the narrow Gaussian line (dot-dashed line).

With this model the soft band variability is due to both blurred reflection and continuum variability while the hard band (above 3 keV) is dominated by the power law continuum and a large reflection component. Another interpretation of the soft excess could be absorption by a relativistic wind (Chevallier et al. 2006). Our recent observations at higher energy with Suzaku will allow to discriminate between these two interpretations.

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