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Broad-band XMM-Newton X-ray spectra of new INTEGRAL AGN

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Abstract. We present the broad-band (0.5-150 keV) spectrum of a sample of nine bright type 1 Seyfert galaxies discovered/detected by *INTEGRAL* and subsequently observed with XMM–*Newton* for the first time in the 0.5-10 keV energy range. Their intrinsic continuum has been empirically described by an exponential cut-off power-law with reflection and Fe emission line reprocessing features overimposed. We obtained a photon index distribution which peaks at flat values ($\Gamma \sim 1.5$) and cut-off energies constrained in six out of nine sources. An FeK line is detected in all the sources of the sample and the relatively low equivalent width measurements do not appear to correlate with the reflection component which is very strong in three objects (R> 1). Given the non simultaneity of the XMM and INTEGRAL observations, spectral and/or flux variability could plays an important role in the determination of the spectral parameters. Alternatively, we modeled the broad-band spectra with a power-law absorbed by partial covering medium and found this description equally adequate for half of the sources in this sample.

Key words. galaxies: Seyfert – X-rays: galaxies

1. Introduction

The unique capabilities of the IBIS (Ubertini et al. 2003) instrument on board INTEGRAL allow the detection of sources above 20 keV at the mCrab level with an angular resolution of 12′ and a typical point source localization accuracy of 2-3′. During its first few years of life, INTEGRAL has surveyed a large portion of the sky detecting many galactic/extra-galactic objects and discovering new/unidentified sources (Bird et al. 2007, 2006, Bassani et al. 2006). Here we present the broad-band spectral analysis of a sample of 9 sources which are associated with active galactic nuclei (AGN) previously undetected in the X-ray band, despite the fact that they are all very bright (a few mCrab level or 2-10 $\times 10^{-11}$ erg cm^{-2} s^{-1} in the 20-100 keV band). All of them have been optically classified as Seyfert galaxies of type 1-1.5 (Masetti et al. 2004, 2006a, 2006b).

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2. The INTEGRAL and XMM-Newton data

The INTEGRAL data presented here consist of several pointings performed by the low-energy instrument ISGRI (INTEGRAL Soft Gamma-Ray; Lebrun et al. 2003) between revolution 12 and 429, i.e. the period from launch to the end of April 2006 (see Bird et al. 2006, 2007, for details). The sources have been observed with XMM-Newton between March and August 2006. All sources but ESO 209-12 belong to a complete sample of AGN detected by INTEGRAL above 20-40 keV flux of 0.9×10^{-11} erg cm^{-2} s^{-1}. The XMM–*Newton* and INTEGRAL data were fitted together and analyzed using XSPEC v.11.3.2 (Arnaud 1996). We choose to fix the cross-calibration constant to 1 and analyze individually source by source the significant variations from this value. Possible miscalibration effects might be present and/or variability in the sources given that the XMM–*Newton* and INTEGRAL observations are not simultaneous.

In this work we aim at determining primarily the slope of the power-law continuum (which is a main issue for the correct estimate of the additional spectral components), the high energy cut-off and to a lesser extent the reflection component and its associated iron fluorescence line. Therefore, we follow a conservative approach by using a *pexrav* model and/or a power-law partially absorbed (*pcfabs* model in XSPEC) to describe the continuum of these objects.

3. Discussion and Conclusions

By applying a *pexrav* model to our sources we find a photon index distribution which peaks at flat values $\Gamma \sim 1.5$. The hard X-ray selection of the sample may explain this result. Although, for some objects of the sample, the alternative modeling of the continuum with a partial covering absorption applied to a simple power-law steepen the spectra to values commonly observed in type 1 AGN. Six out of nine objects in the sample have a constrained cut-off at low energies ranging from 40 keV to 140 keV, which correlates with the spectral slopes as already observed in the literature (Petrucci et al. 2001, Perola et al. 2002) as well as the observed correlation between the reflection component and the Γ (Zdziarski et al. 1999) both probably ascribed to the well known interdependence of the parameters in the *pexrav* model and therefore due to an artifact of modeling degeneracies, as recently demonstrated (Mattson, Weaver & Reynolds 2007). The reflection parameter has been constrained in four sources of the sample and three of show strong reflection. However, we could not find a correspondence between the strong reflection parameter and the equivalent width of the narrow Fe emission line, detected in all the sources. Variance in the iron abundance and/or possible anisotropy of the source of seeds photons could be responsible for what found, as well as spectral and flux variability of the sources as already observed in several bright Seyfert galaxies (Miniutti et al. 2007). A more detailed description of the broad-band XMM and INTEGRAL spectrum of these objects is deferred to a forthcoming work (Panessa et al. in preparation).

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