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Probing the evolution of Active Galactic Nuclei using the narrow iron Kα line

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Abstract. A large fraction of the AGN output power is emitted in the X-rays, in a region very close to the supermassive black hole (SMBH). The most distinctive feature of the X-ray spectra of AGN is the iron Kα line, often observed as the superposition of a broad and a narrow component. While the broad component is found in only $\sim$ 35–45% of bright nearby AGN, the narrow component has been found to be ubiquitous. The narrow Fe Kα line is thought to be produced in the circumnuclear material, likely in the molecular torus. Given its origin, this feature is possibly the most important tracer of neutral matter surrounding the SMBH. One of the most interesting characteristics of the narrow Fe Kα line is the decrease of its equivalent width with the continuum luminosity, the so-called X-ray Baldwin effect (Iwasawa & Taniguchi 1993). This trend has been found by many studies of large samples of type-I AGN, and very recently also in type-II AGN (Ricci *et al.* 2013c, submitted to ApJ). The slope of the X-ray Baldwin effect in type-II AGN is the same of their unobscured counterparts, which implies that the mechanism at work is the same. Several hypothesis have been put forward in the last decade to explain the X-ray Baldwin effect: i) a luminosity-dependent variation in the ionisation state of the iron-emitting material (Nandra *et al.* 1997); ii) the decrease of the number of continuum photons in the iron line region with the Eddington ratio, as an effect of the well known correlation between the photon index and the Eddington ratio (Ricci *et al.* 2013b, submitted to MNRAS); iii) the decrease of the covering factor of the torus with the luminosity (e.g., Page *et al.* 2004, Ricci *et al.* 2013a A&A 553, 29) as expected by luminosity-dependent unification models (e.g., Ueda *et al.* 2003). In my talk I will review the main characteristics of the narrow Fe K? line, and present the results of our recent works aimed at explaining the X-ray Baldwin effect using iron-line emitting physical torus models (Ricci *et al.* 2013a,b), and at understanding the origin of the Fe K? line (Ricci *et al.* 2013c). I will focus in particular on the importance of the Fe Kα line as a probe of the evolution of the physical characteristics of the molecular torus with the luminosity.
