On the Lx-L6micron ratio as a diagnostic for Compton-thick AGN

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As the mid-IR luminosity represents a good isotropic proxy of the AGN power, a low X-ray to mid-IR luminosity ratio is often claimed to be a reliable indicator for selecting Compton-thick (CT) AGN. We assess the efficiency of this diagnostic by examining the 12mu IRAS AGN sample for which high signal-to-noise XMM observations have been recently become available. We find that the vast majority (10/11) of the AGN that have been classified as CT on the basis the X-ray spectroscopy by Brightman & Nandra present a low Lx/L6 luminosity ratio, i.e. lower than a few percent of the average AGN ratio which is typical of reflection-dominated CT sources. At low Lx/L6 ratios we also find a comparable number of AGN, most of which are heavily absorbed but not CT. This implies that although most Compton-thick AGN present low Lx/L6 ratios, at least in the local, Universe, the opposite is not necessarily true. Next, we extend our analysis to higher redshifts. We perform the same analysis in the CDFS where excellent quality chandra (4 Ms) and xmm (3 Ms) X-ray spectra are available. We derive accurate X-ray luminosities for chandra sources using X-ray spectral fits, as well as 6mu luminosities from SED fits. We find 8 AGN with low Lx/L6 ratios in total, after excluding one source where the 6mu emission primarily comes from star-formation. One of these sources has been already demonstrated to host a CT nucleus, while for another one at a redshift of z=1.22 we argue it is most likely CT on the basis of its combined chandra and xmm spectrum. We find a large number of non CT contaminant with low Lx/L6 ratios. The above suggest that a low Lx/L6 ratio alone cannot ascertain the presence of a CT AGN, albeit the majority of low Lx/L6 AGN are heavily obscured. The two most reliable CT AGN in the high redshift Universe have high Lx/L6 ratios, showing that this method cannot provide complete CT AGN samples.

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