S24a The Covering Factor of Dust and Gas in Swift/BAT Active Galactic Nuclei

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We quantify the luminosity contribution of active galactic nuclei (AGN) to the 12 μm, mid-infrared (MIR; 5-38 μm), and the total IR (5–1000 μm) emission in the local AGN detected in the all-sky 70-month *Swift*/Burst Alert Telescope (BAT) ultra hard X-ray survey. We decompose the IR spectral energy distributions (SEDs) of 587 objects into AGN and starburst components using AGN torus and star-forming galaxy templates. This enables us to recover the AGN torus emission also for low-luminosity end, down to $\log(L_{14-150}/\mathrm{erg\ s^{-1}}) \simeq 41$, which typically have significant host galaxy contamination. We find that the luminosity contribution of the AGN to the 12 μm, the MIR, and the total IR band is an increasing function of the 14–150 keV luminosity. We also find that for the most extreme cases, the IR pure-AGN emission from the torus can extend up to 90 μm. The obtained total IR AGN luminosity through the IR SED decomposition enables us to estimate the fraction of the sky obscured by dust, i.e., the dust covering factor. We demonstrate that the median of the dust covering factor is always smaller than that of the X-ray obscuration fraction above the AGN bolometric luminosity of $\log(L_{\mathrm{bol}}/\mathrm{erg\ s^{-1}}) \simeq 42.5$. Considering that X-ray obscuration fraction is equivalent to the covering factor coming from both the dust and gas, it indicates that an additional neutral gas component, along with the dusty torus, is responsible for the absorption of X-ray emission.