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First measurement of coronal properties in two luminous, high-z QSOs

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X-ray emission from AGN is believed to be produced via Comptonization of optical/UV seed photons emitted by the accretion disk, up-scattered by hot electrons in a corona surrounding the black hole. A critical compactness vs. temperature threshold is predicted above which any increase in the source luminosity would generate positron-electron pairs rather than continue heating the coronal plasma.
Current observations seem to confirm that all AGN populate the region below this critical line. Pair production models, however, have never been probed by observations in the high-luminosity regime, where the critical line is expected to reach low temperatures.
To fill this observational gap, we selected two luminous (log(LBol)>47.5 erg/s) quasars, 2MASSJ1614 (z=1.86) and B1422 (z=3.62), and obtained XMM and NuSTAR deep observations. We performed detailed spectral analysis of their quasi-simultaneous soft and hard X-ray data, in order to constrain the parameters of their coronae. Using a phenomenological cut-off power-law model plus reflection, we derived rest-frame values of the high energy cut-off of Ecut=106+102-37 keV and Ecut=66+17-12 keV, respectively. Comptonization models consistently give as best-fit parameters electron temperatures of ~45 keV and ~28 keV, and optically thick coronae (τ >1). These low coronal temperatures fall in the limited region allowed at these luminosities to avoid runaway pair production.

Topic

Active Galactic Nuclei: accretion physics and evolution across cosmic time

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