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On the accuracy of reflection-based supermassive black hole spin measurements in AGN

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It is genreally accepted that active galactic nuclei (AGN) are powered by accretion onto supermassive black holes (SMBHs) of masses $M \sim 10^{6-9}$ $\mathrm{M}_{\odot}$. The matter is thought to accrete in a disc that is geometrically thin and optically thick, emitting the bulk of its light in the optical/ultraviolet range. Moreover, AGN are strong X-ray emitters. These X-rays are thought to be triggered by Compton up-scattering of the disc photons off hot ($kT \sim 10^9$ K) transrelativistic electrons, usually referred to as the X-ray corona. Several observational evidences suggest that the corona is located in the close vicinity of the SMBH (below ˜10 gravitational radii). Hence, X-rays from AGN can be used in order to probe these regions, which can be considered as unique laboratories to directly test the effects of general relativity. In particular, the detection of a strong relativistic "reflection component", in X-ray spectra, is potentially the most powerful method to measure the spin, one of the fundamental observable properties of BHs. The spin measurement, particularly in AGN, is of great interest for understanding the physical processes on scales ranging from the circumnuclear region out to the host galaxy. It would be then timely to test how reliable the reflection-based BH spin measurements that can be currently achieved are. I will present in my talk an attempt to answer this question through blind-fitting a set of simulated high-quality *XMM-Newton* and *NuSTAR* spectra, considering the most generic configuration of AGN. Each member of our group (composed of three persons) simulated ten spectra with multiple components that are typically seen in AGN. The resulting spectra were blindly analysed by the other two members. Our main results show that at the high signal-to-noise ratio assumed in our simulations, neither the complexity of the spectra, nor the input value of the spin are the major drivers of our results. The height of the X-ray source instead plays a crucial role in recovering the spin. In particular, a high success rate in recovering the spin values is found among the accurate fits for a dimensionless spin parameter larger than 0.8 and a lamp-post height lower than five gravitational radii. I will then discuss the implications of our results and how some of the limitations faced in spin determination can be overcome.

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