

NGC 4151

Observation plan

NGC 4151 is approved as a Phase A target, for a total of 180 ks. Nominally, this exposure is to be taken in 4 segments of 45 ks, with the goal of catching the distinctive high-flux, low-obscuration and low-flux, higher-obscuration states of NGC 4151. The 4 segments can be scheduled almost at random; separating them by at least 2 weeks may be optimal.

If this scheduling proves impractical, longer exposures are preferred over short ones (e.g., 3 exposures of 60 ks, or 2 exposures of 90 ks). The chances of catching both states would then be reduced but it is important to obtain sensitive spectra in every instance.

Resolve should be run in its normal mode, with no filter.

Xtend should be run in 1/8 window mode (to prevent photon pile-up).

Immediate objectives

- [1] Reveal the origin of the narrow Fe K line through a detailed study of its velocity broadening and shape, and variability within and across observations.
- [2] Search for variable ultra-fast outflows and measure the gas properties with unprecedented sensitivity, to reveal the origins and driving mechanisms of UFOs. Optimally, the radius and/or gas density will be constrained to determine the mass flux and kinetic luminosity of the UFOs. Constraints on the UFO duty cycle may be possible.
- [3] Measure slower ionized absorbing outflows in the Fe K band, and at low energy, to determine their launching radii, driving mechanisms, mass flux, kinetic luminosity, and connections to geometries that are also revealed in optical and IR bands.
- [4] Search for relativistic disk reflection to reveal the inner accretion disk and its interaction with the compact component of a corona, and to potentially measure the spin of the black hole.
- [5] Search for evidence of lags between the continuum and discrete line features, as an independent window on their physical origins.
- [6] Understand the nature of the distinctive source states in NGC 4151, with the advantage of high-resolution, high-sensitivity X-ray data in the Fe K band, in concert with broad-band optical and UV data and complementary X-ray data