

M82

Observation plan

M82 will be observed with the nucleus of the galaxy coincident with the optical axis for a single pointing of 50 ks. If the observation must be broken into smaller segments, we request similar roll angles (or additional exposure time on the order of 5 ks per angle to ensure the spectra from the outer ring of Resolve pixels are well exposed).

No filter is required, and we request full-frame Xtend data to achieve the best astrometric solution

Immediate objectives

- [1] Determine whether the wind speed exceeds the escape velocity, its impact on the surrounding gas, and the partitioning of wind energy among hot, warm, and cool gas by measuring (and possibly mapping) the velocity of hot, nebular gas using soft X-ray lines.
- [2] Confirm that hot gas pressure is the primary wind driver and constrain the mass-loading rate and thermalization efficiency by measuring the velocity of the superheated nuclear gas using Fe XXV and Fe XXVI lines. Constrain the role of cosmic rays in wind acceleration via comparison to predictions of the velocity profile.
- [3] Determine the metal loss rate from the galaxy and confirm the Type II SNe enrichment scenario by measuring the chemical abundances in the extended hot wind.
- [4] Quantify the contribution to soft X-rays from the wind nebula from (a) cooling wind material, (b) shocks of entrained cool clouds or with the surrounding medium, and (c) charge exchange by measuring the temperature structure from global fits and He-like triplets and by measuring the CX contribution to strong line complexes.
- [5] Investigate the possibility that M82 X-1 is an IMBH by searching for a reported, but ambiguous, broad Fe Ka line. We anticipate a combined analysis of M82 X-1 and X-2 due to the angular resolution, that will include both Resolve and (modestly piled-up) Xtend data.
- [6] Determine the relationship between hot, warm, and cool wind gas by comparing the X-ray velocity structure to that of the warm and cool phases (from archival data and published papers).
- [7] Search for an explanation of the extensive, diffuse hard X-ray nebula in M82.