

# Virgo/M87

## Observation plan

Three pointings will be performed first:

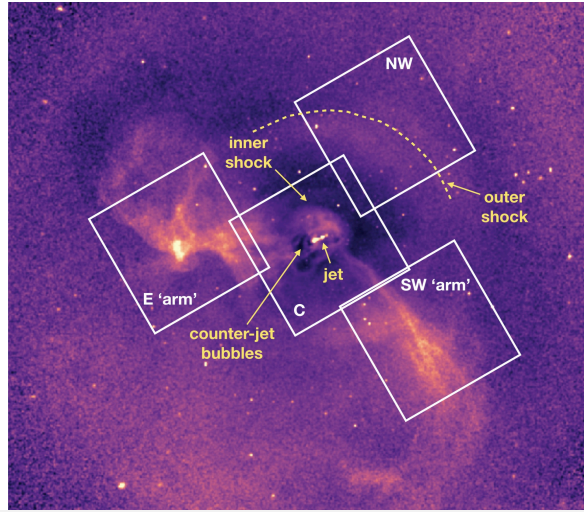
C (12:30:48.99,+12:23:22.57): 100 ks

E (12:31:02.09,+12:23:26.67): 150 ks

NW (12:30:42.87,+12:26:05.29):100 ks

An additional pointing to the SW will be performed if the immediate objectives regarding gas uplift physics (see (6) below) are not fulfilled with the E pointing, and if the relative positions of various lines within the Fe-L shell are demonstrated to be measured with sufficient accuracy from the existing data. Details of the additional observation:

SW (12:30:38.63,+12:21:25.45): 150 ks



## Immediate objectives

### Central pointing:

- [1] Measure the turbulent motions in the hot ICM close to the SMBH, using line broadening and resonant scattering.
- [2] Measure the chemical composition, including new detections of rare odd-Z elements (Na, Al).
- [3] Probe the detailed multi-temperature structure in the cluster core.

### Eastern pointing:

- [4] Determine the turbulent velocity broadening and line of sight velocity in the hot ICM associated with the Eastern AGN lobe rising buoyantly through the M87 atmosphere.
- [5] Measure the average chemical composition in the wake of the buoyant AGN bubble.
- [6] Test the power of the data to constrain multi-temperature, multi-metallicity, multi-velocity models.

### Southwestern pointing (conditional):

[4',5',6'] If the analysis in objective 6 demonstrates that multi-velocity fits (using the relative shifts of various lines in the Fe-L complex) are feasible with well controlled systematics, but fail to detect the expected velocity shift between the cool uplifted gas and hot spherically symmetric atmosphere, an additional observation of the SW arm will be performed. This will provide a full picture of the interaction between the radio lobes and the ICM along two 'arms' with very different X-ray and radio morphologies.

### Northwestern pointing:

- [7] Measure bulk characteristic turbulence in a relaxed control region located away from AGN lobes but at the same cluster-centric radius.
- [8] Measure the undisturbed radial gradient of various metal abundances, and compare with the AGN lobe direction.
- [9] Aid with atomic line database calibration for a quasi-isothermal plasma.