

DRM Science Case G9: *A Survey of Black Holes in Different Environments*

A spatially resolved spectroscopic survey of the centers of elliptical and early type galaxies (PI: W. Freudling)

Goals

- o BH in Milky Way out to Virgo distance
- o resolve Sphere of Influence for $M \sim 10^9 M_{\text{sun}}$ out to $z \sim 0.2$
- o search for extremely massive BHs $M > 10^{10} M_{\text{sun}}$ out to $z \sim 0.3$

Requirements

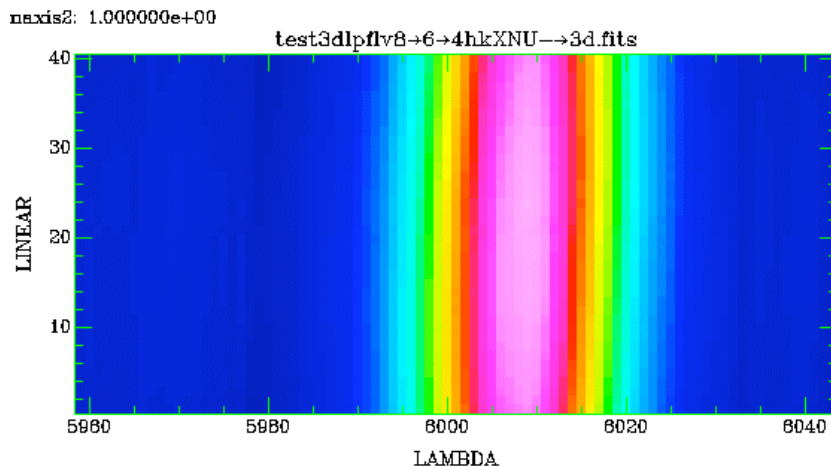
- o spectral resolution: 1000- 10000
- o spatial resolution: 5 mas (LTAO)
- o wavelength: red - NIR

Simulations

- 3-d models: multi-Gaussian expansion density distribution (Emsellem et al. 94, Cappellari 2002)
 - fit for M87 (giant elliptical)
 - inclination 90 degrees(edge-on), constant M/L, different values for the BH mass, redshift
- V and σ_v maps for M87 (giant elliptical)
- convolve with I-band LTAO PSF
- background (atmosphere lines+continuum) + telescope (throughput) + detector (QE)
- read-out noise, dark current, Poisson noise

Results

- velocity map: NGC4486 + BH
 $M=10^9 M_{\text{sun}}$
- redshift: $z = 0.2$
- simulated spectrum for a spheroidal geometry with a constant SFR and nebular emission lines
- 3 mas/pixel
- spectrum pixel size is 1.0 \AA



Paranal-like site

background continuum in R-band
telescope throughput for an
aluminum coating

rdnoise = $2.0 e^-$, dark current = $2 e^-$
/h/pix and QE = 90%, Poisson noise
exposure time: 1800 sec

Outlook

- Measure velocity and velocity disp.
- Stellar absorption lines
- Different wavelength ranges
- Different AO/PSFs
- Test case: NGC 4486A (Nowak et al. 2007)