Gemini NIFS observations of the central region of the Seyfert Galaxy Mrk 766

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Recent studies about Active Galactic Nuclei (AGN) reveals that the molecular and the ionized gas have different flux distributions and kinematics. Usually, the molecular gas is restricted to the plane of the galaxy while the ionized gas extends to high latitudes above it being associated with the radio jet. These results are interpreted as follows: the molecular gas can be considered a tracer of the feeding of the AGN while the ionized gas is considered a tracer of its feedback (e g. Storchi-Bergmann, 2010, MNRAS, 402, 819; Riffel et al., 2011, MNRAS, 411, 469).

In this work we present results of Integral Field Spectroscopy of the central region of the Seyfert Galaxy Mrk 766, obtained with the Gemini-North telescope using the Near-Infrared Integral Field Spectrograph (NIFS), with an angular resolution of 0.2 arcsec. The Mrk 766 has a Seyfert 1 nuclei and is located at a distance d=60.6 Mpc, where 1" corresponds to 294 pc in the galaxy. The data reduction followed the standard IRAF procedure.

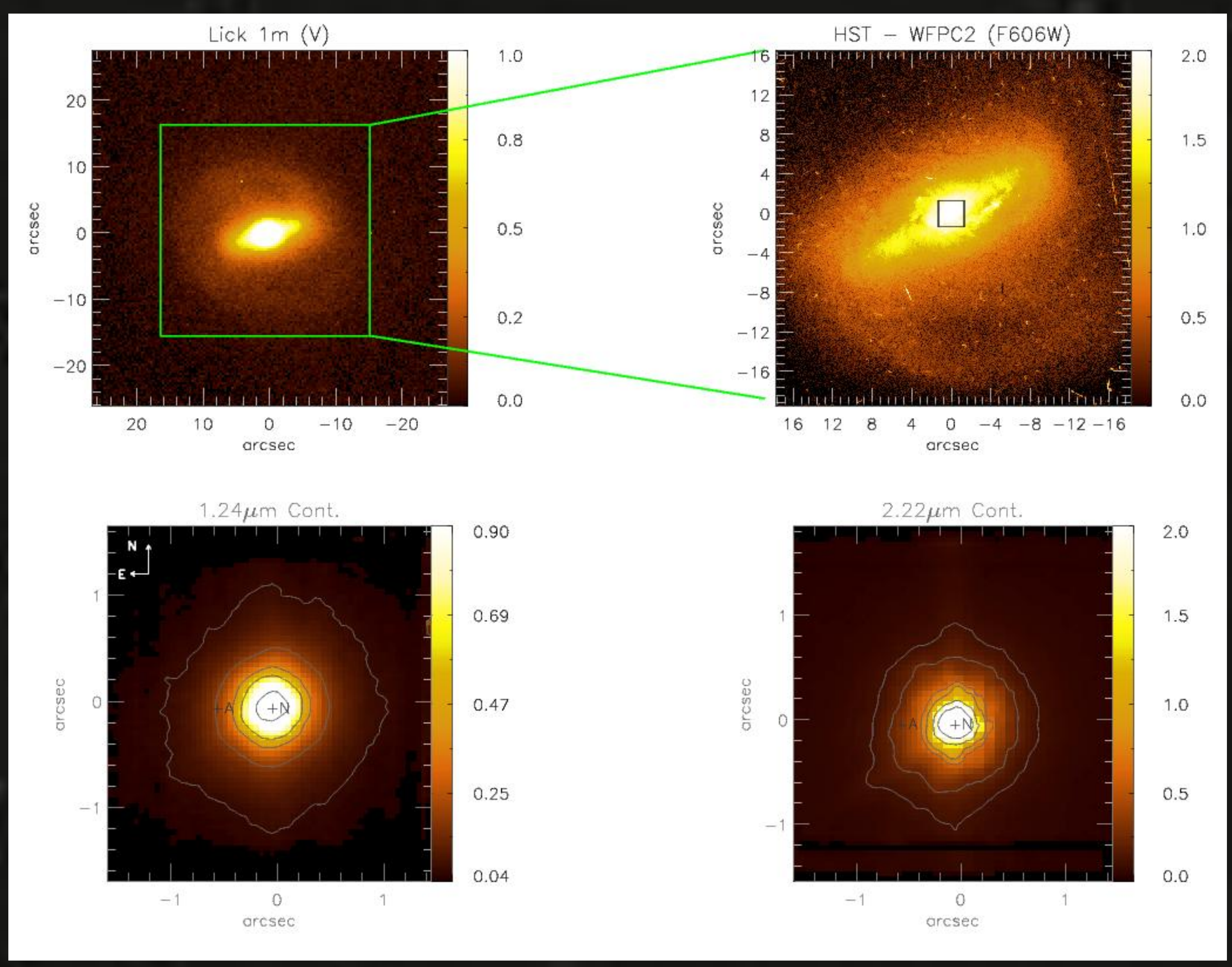

Figure 1 – Continuum images for the Mrk 766. Top-left panel: Large scale image in V band obtained at Lick observatory (Leighly, Karen M. et al, *1999ApJS,125, 349*). Top-right panel: Image from HST – WFPC2 (F606W) (*Malkan M.A. et al,* 1998ApJS, 117, 25). Bottom panels show the continuum emission for J and K bands respectively, obtained from the NIFS data cubes.

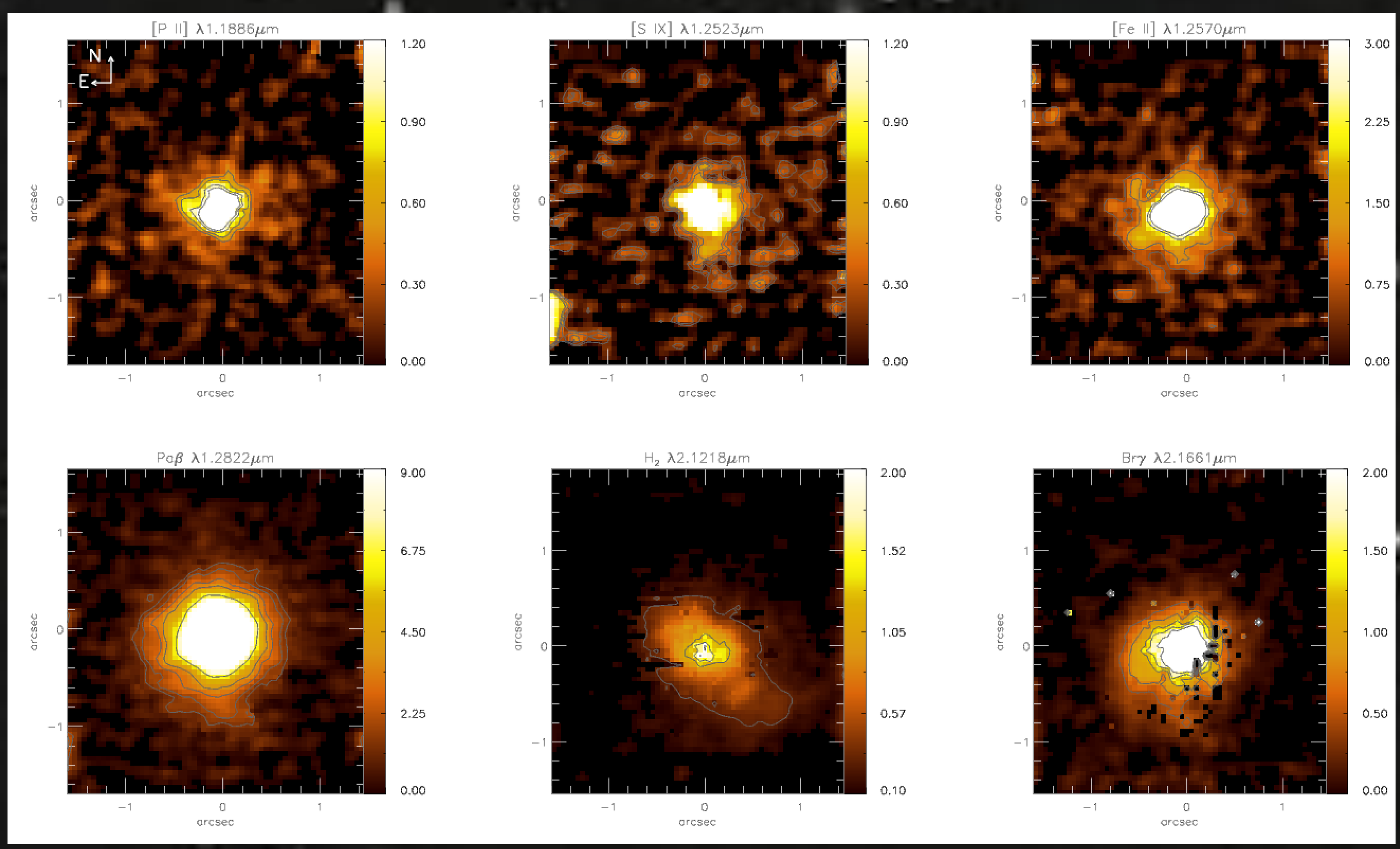

Figure 2 – Emission lines flux distribution. The lines are identified above each panel.

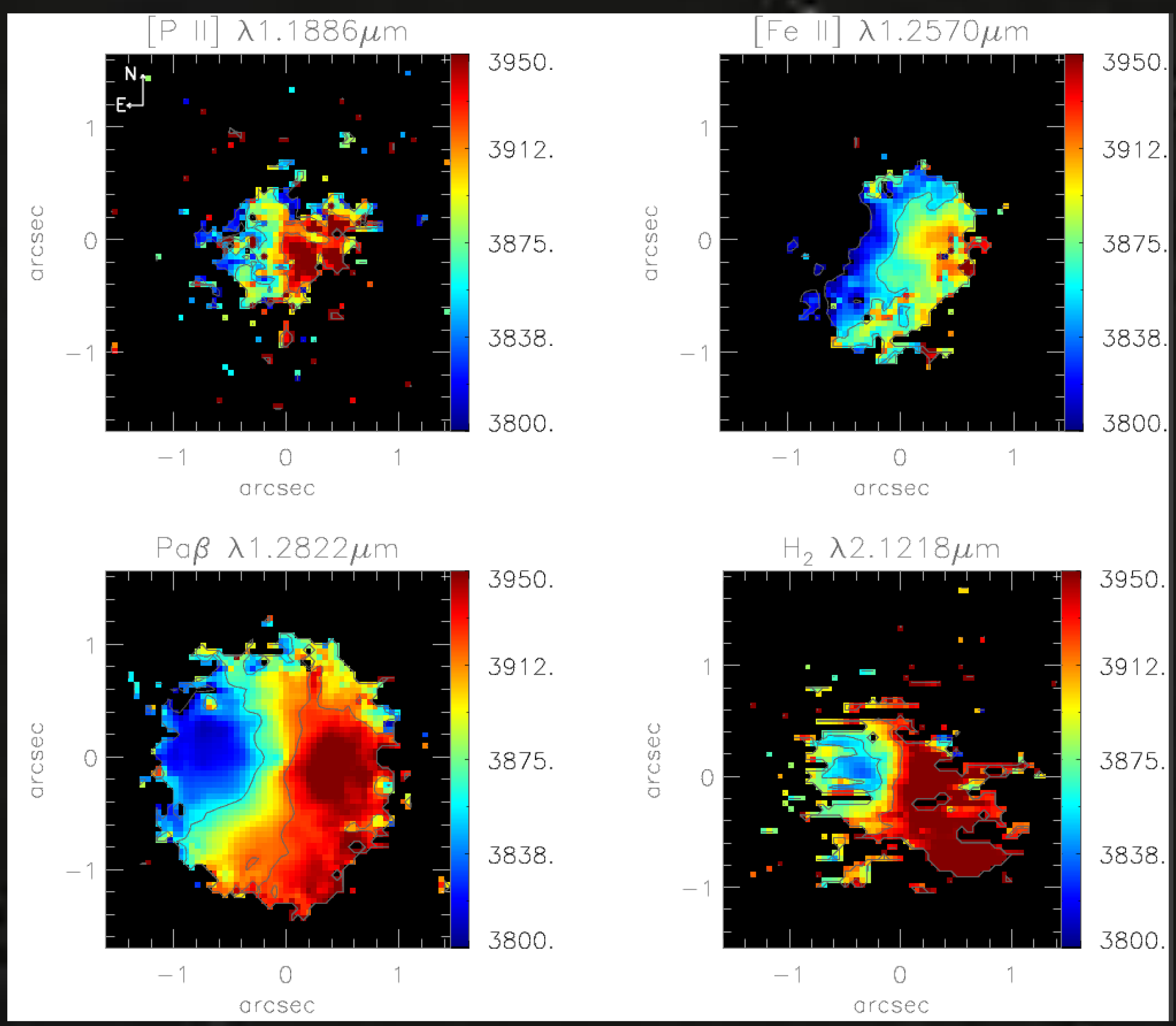

Figure 3 – Velocity field. The lines are identified above each panel. We can see a "spider diagram" for almost all lines.

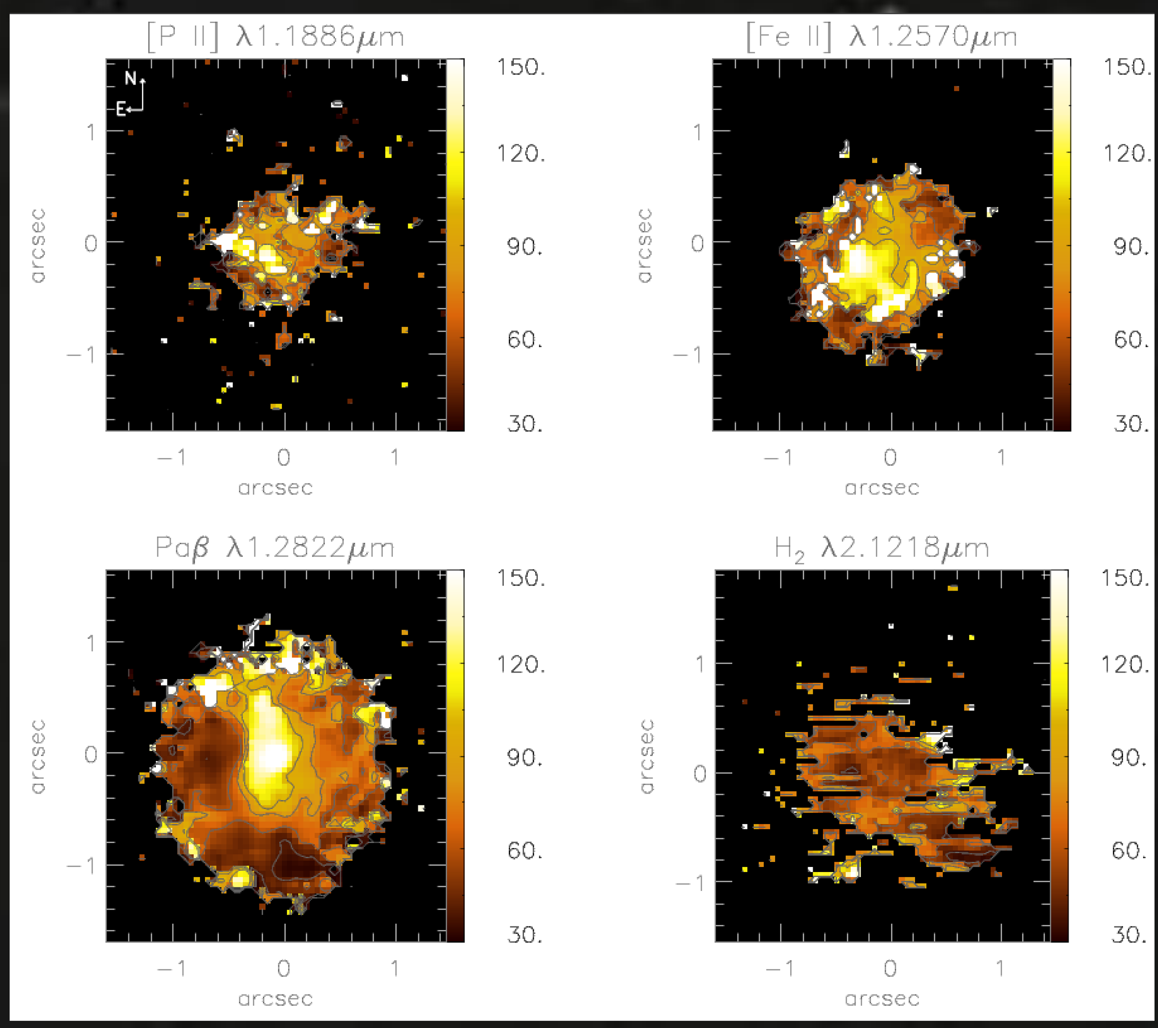

Figure 4 – σ maps for the same lines of figure - 3.

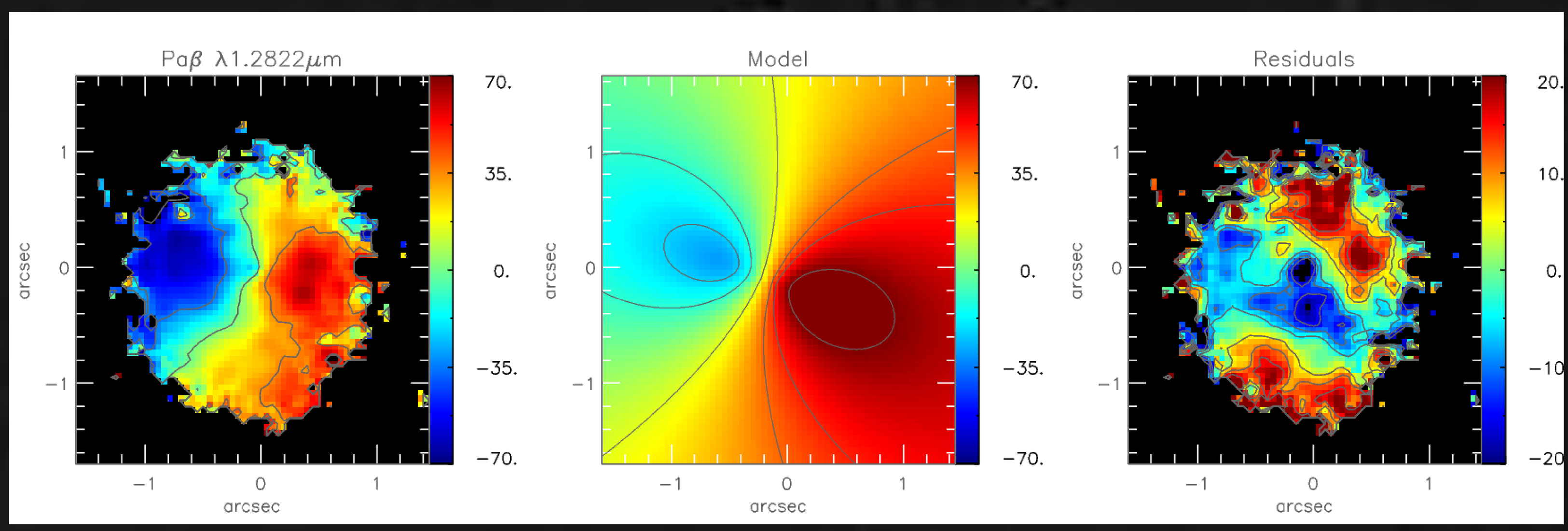

Figure 5 – Rotating disc model for the Paβ velocity field (middle panel) and residual map between observed and modeled velocities (right panel).

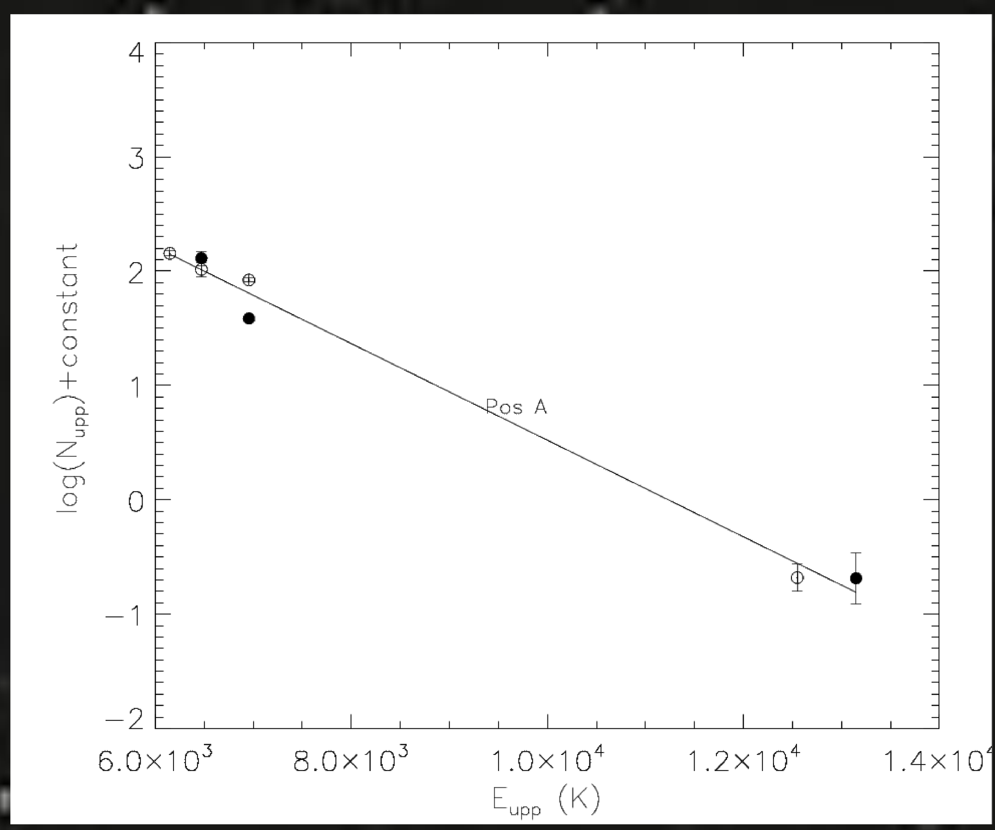

Figure 6 - Relation between N_{upp} and E_{upp} for the H_2 emission line for thermal excitation at 0.6" east from the nucleus, resulting results in an excitation temperature ~ 2367 K.

Final considerations

Through the maps shown before, we note that all lines have extended emission until ~ 250 pc from the nucleus and have their peak on it. The velocity maps suggests rotation for all lines with an amplitude of ~ 65km/s.

The σ maps show values ranging from 30 to 150 km/s where H_2 presents the smallest values of σ (~ 50 km/s), while the [Fe II] has the highest values, reaching 150 km/s southeast from the nucleus, suggesting that the ionized gas and molecular gas have different kinematic.

In order to obtain the systemic velocity, mass and a few other parameters we fit a rotating disc model, for the Paβ velocity field and we found the systemic velocity of the galaxy Vs=3823 km/s and a bulge mass of ~6.9×10^8 solar masses.

The thermal excitation temperature of H_2 can be obtained from the fluxes of its K-band emission lines from the fitting of a linear equation to the N_{upp} vs E_{upp}, assuming that the emitting gas is in LTE (Riffel et al. 2011, MNRAS, 411, 469), which results in an excitation temperature ~2367 K.