

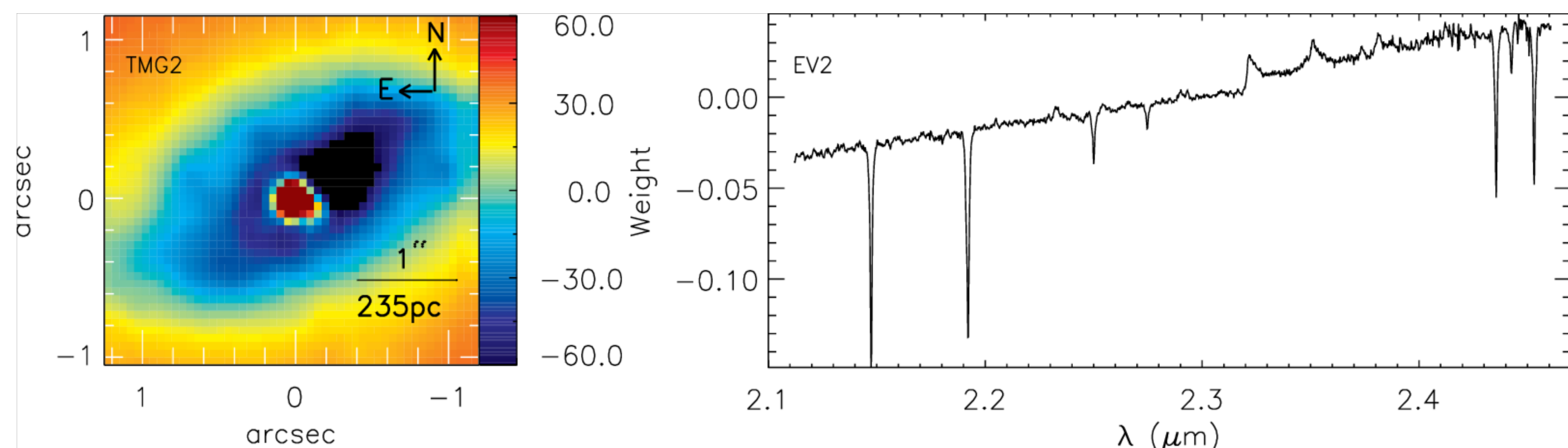
Principal Component Analysis of NIFS Datacubes for Seyfert Galaxies

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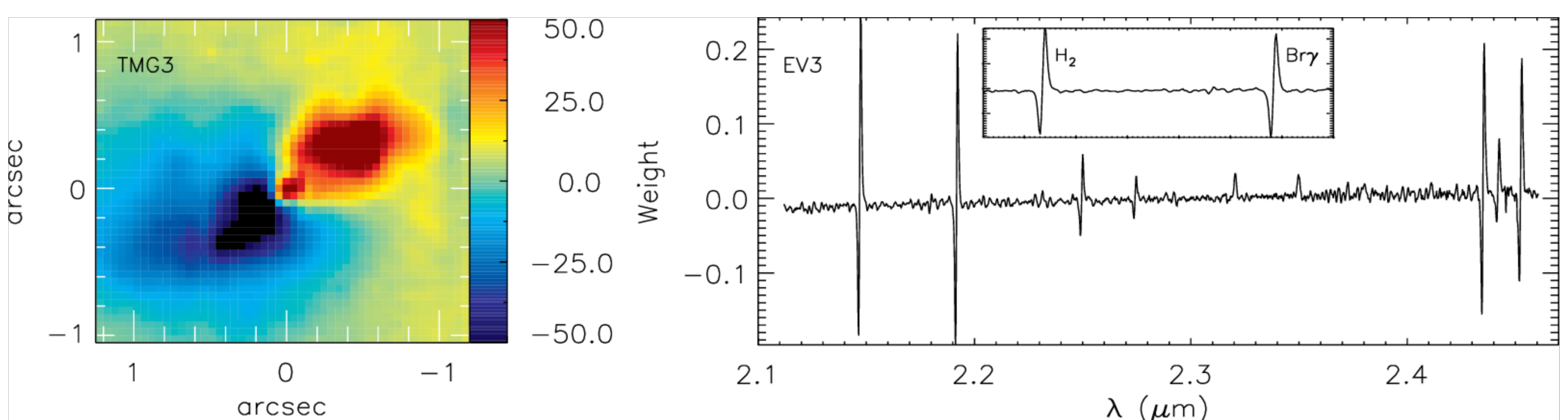
Introduction

We used the Principal Component Analysis (PCA) tomography technique (Steiner et al. 2009, MNRAS, 395, 64) to analyze K band datacubes of the central regions of the Sy2 galaxies Mrk 1066 and Mrk 1157. These data were obtained with the instrument NIFS at Gemini North telescope at a spatial resolution of ≈ 35 pc and previously published by our group. The first eigenvector for both galaxies corresponds to more than 95% of the variance of the cube and is dominated by emission of the bulge and line emission, similar to the integrated spectrum for the original cubes.

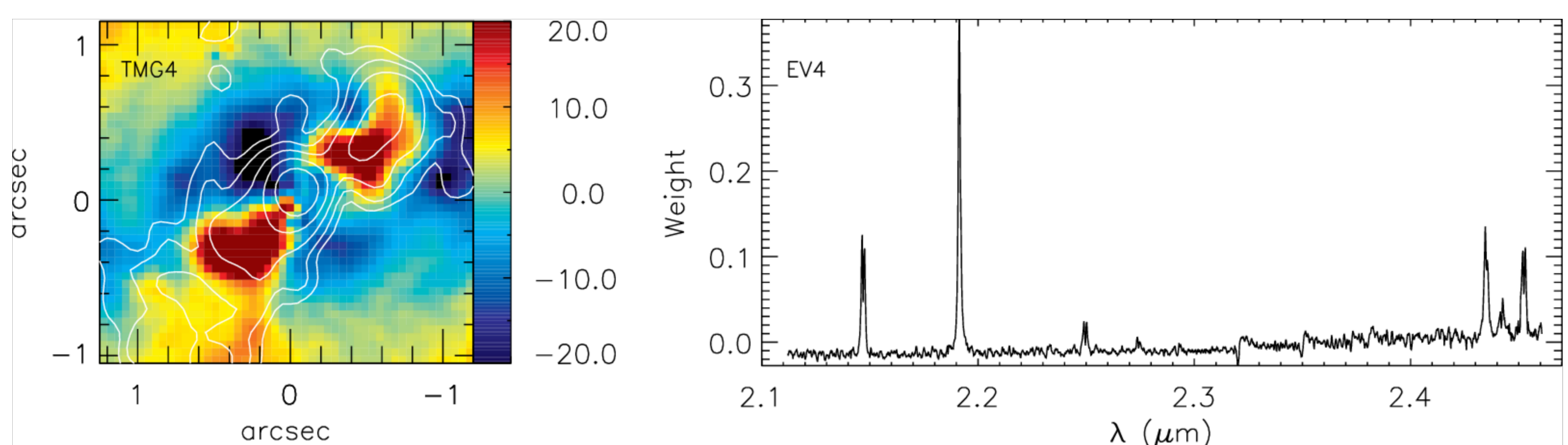
Results: Mrk 1066



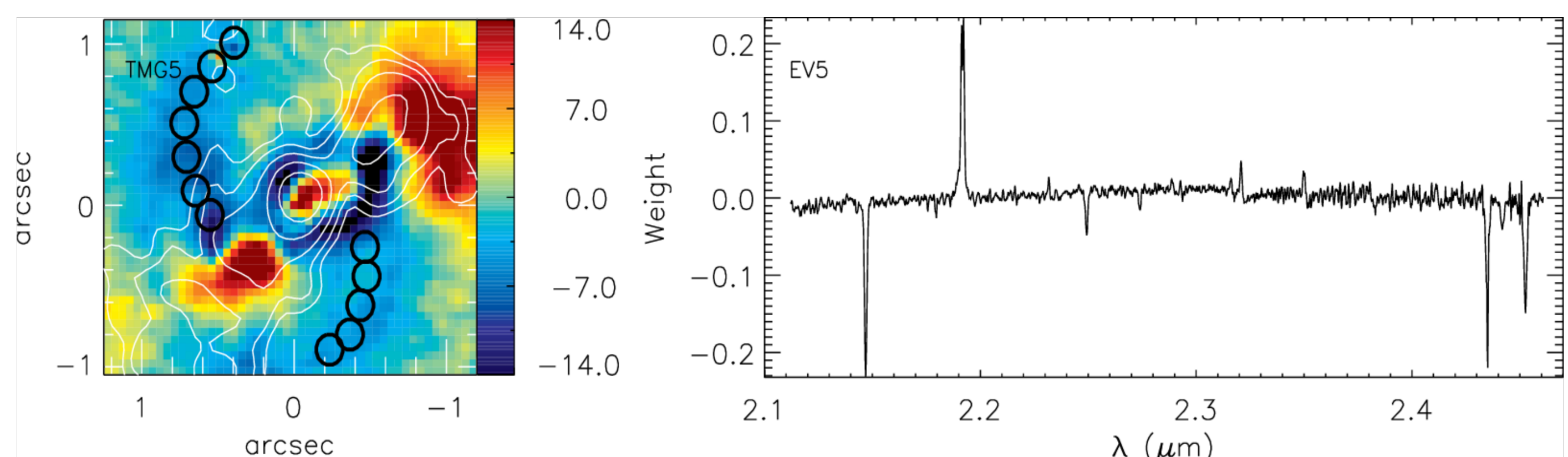
Tomogram (TMG) 2, and eigenvector (EV) 2 for Mrk 1066. An anti-correlation between the emission at longer and shorter wavelength is observed, with the emission at larger wavelengths being observed at the nucleus. We attributed this EV to emission from the dusty torus.



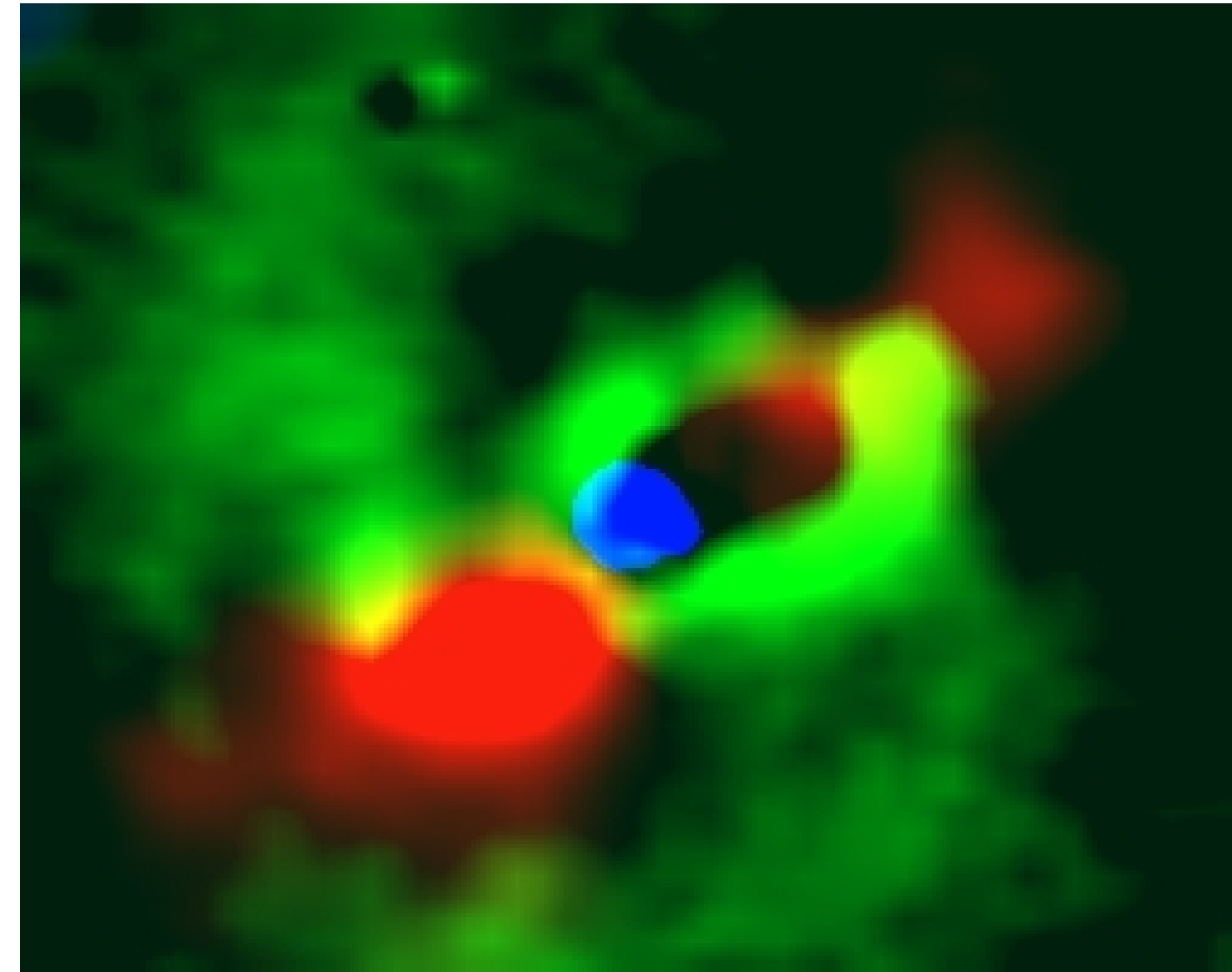
The EV3 shows that the blue and the red wings of the emission lines are anti-correlated. The joint analysis of MG3 and EV3 indicates that they are originated from gas emission on a rotating disk.



The EV4 shows a correlation among the emission lines of the H₂ and the Bry, being associated to the radio jet (observed as white contours in TMG4).

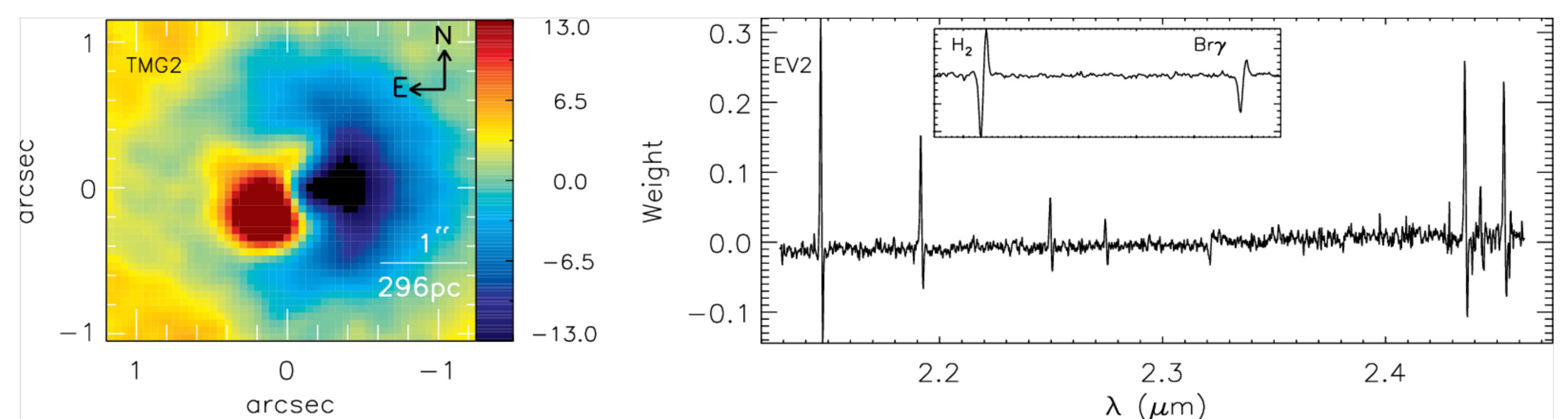


The EV5 and TMG5 show an anti-correlation between the H₂ and Bry lines. It is seen that Bry emission is observed mainly along the radio jet, while the H₂ emission is seen in spiral arms connected to a circum-nuclear ring.

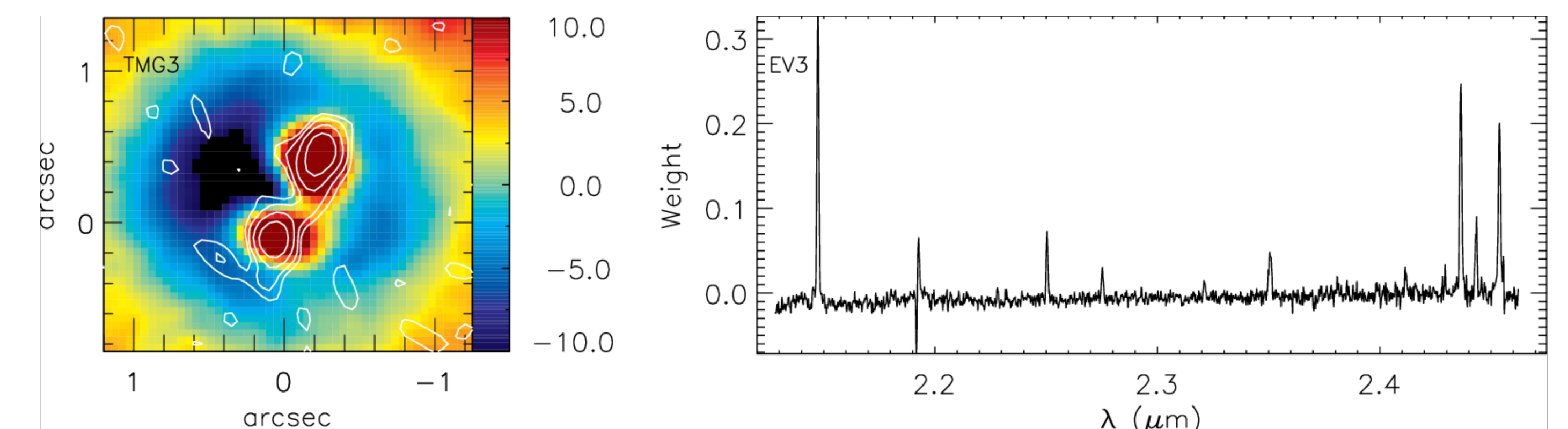


RGB image: Red: Bry flux map, measured from a reconstructed datacube using only the EV4, to show the correspondence of the ionized-gas emission with the radio jet. Green: H₂ 2.12 μm flux map obtained from a reconstructed cube using only the EV5, to enhance the spiral structures and circum-nuclear ring. Blue: Continuum map from a reconstructed cub using only the EV3, to show the dust emission.

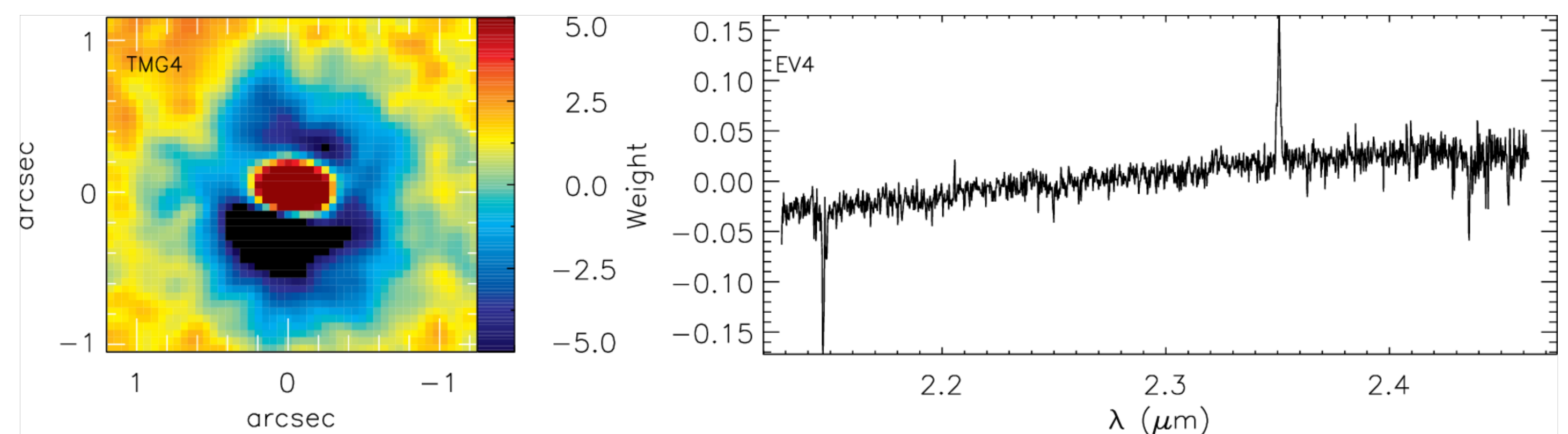
Results: Mrk 1157



The EV2 shows that the blue and the red wings of the emission lines are anti-correlated, suggesting the presence of a rotating disk.



The EV3 shows a correlation among the emission lines of the H₂, Bry and [Ca VIII] being associated to the radio jet (observed as white contours).



The EV4 shows an anti-correlation between the emission lines of the H₂, and [Ca VIII]. The H₂ emission is observed in the circum-nuclear region, while the [Ca VIII] is originated from an unresolved structure at the nucleus. It should be noticed that there is an anti-correlation between the emission in red and blue wavelengths, probably due to the emission of the dusty torus.

Conclusions:

Using the PCA Tomography to analyse K-band datacubes of Mrk 1066 and Mrk 1157 we detected:

- Signatures of the dusty torus for both galaxies;
- Emission line associated to the radio jet for both galaxies;
- Spiral arms in H₂ for Mrk 1066;
- An Unresolved coronal-line emission for Mrk 1157.