

# Morphology, Kinematics and Star Formation in Spiral Galaxies in the *Spitzer Survey of Stellar Structure in Galaxies* (S<sup>4</sup>G)

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**Abstract.** We present a study of the morphology, kinematics and star formation of a sample of 27 isolated spiral galaxies in the *Spitzer Survey of Stellar Structure in Galaxies* (S<sup>4</sup>G), on the basis of H $\alpha$  Fabry-Perot (FP) data from the GH $\alpha$ FaS instrument at the William Herschel Telescope (WHT) in La Palma, complemented with images at 3.6 micron from the Spitzer Space Telescope, and with images in the *R*-band and in H $\alpha$  taken with the ACAM instrument mounted on the WHT. With the FP data we can investigate the gas kinematics in terms of velocity maps and position-velocity diagrams, keys to constrain the secular evolution processes. We can also analyse the morphology and compute the star formation rate (SFR) with the ancillary data.

**Keywords.** galaxies: kinematics and dynamics — galaxies: spiral

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## 1. Motivation

With this survey we can (*a*) perform a detailed study of the kinematic interplay of the ISM and regions of star formation, dust or other activity, (*b*) examine the secular evolution of the galaxy with kinematic studies, manifested in the structural components as spiral arms, bars, rings or lenses and (*c*) discuss possible deviations of the rotation curve that are caused by lopsidedness or asymmetries of the disk.

## 2. Results

In Erroz-Ferrer *et al.* (2012) (arXiv:1208.1409) we have presented the first results of this survey, a kinematical analysis of NGC 864. In the paper we have mainly analysed the kinematic data cubes. Also, we have used other ancillary data, like *R*-band and H $\alpha$  images taken with the instrument ACAM in the WHT, IFU data with the SAURON instrument, also in the WHT, and we used the 3.6 micron S<sup>4</sup>G image.

The data cubes and velocity maps allow the study of the kinematics of every galaxy, including in-depth investigations of the rotation curve, velocity moment maps, velocity residual maps, gradient maps and position-velocity diagrams. In the residual maps, we have found that there are deviations from the circular rotation velocity, confirming the presence of non-circular motions along the bar. These are probably caused by the non-axisymmetrical potential created by the bar. We can also observe the non-circular motions by creating a position-velocity diagram along the kinematic minor axis. In an ideal case without non-circular motions, the velocity profile along the kinematic minor axis would have been completely flat. This confirms that the bar has a significant influence on the kinematics of the galaxy, causing the velocities to deviate from the circular, rotational, motion.