Mon. Not. R. Astron. Soc. **000**, 000–000 (0000) Printed 28 March 2017 (MN LaTeX style file v2.2)

Modelling the gas kinematics of an atypical Lyman alpha emitting compact dwarf galaxy

Maria Camila Remolina-Gutiérrez[1] & Jaime E. Forero-Romero [1] ⋆
[1] *Departamento de Física, Universidad de los Andes, Cra. 1 No. 18A-10 Edificio Ip, CP 111711, Bogotá, Colombia*

28 March 2017

ABSTRACT
Star-forming Compact Dwarf Galaxies (CDGs) resemble the expected pristine conditions of the first galaxies in the Universe and are the best systems to test models on primordial galaxy formation and evolution. Here we report on one of such CDGs,

Key words: galaxies: dwarf — galaxies: individual:Tololo 1214-277 — radiative transfer — Methods: numerical

1 INTRODUCTION

Distant galaxies are key to understand early evolutionary stages of our Universe. Physical conditions in those galaxies allows the emergence of Lyman-α line emission at 1216 Å**?**. Galaxies detected through its Lyman-α emission receive the name of spectra at and named Lyman Alpha Emitters (LAEs).

Currently LAEs are commonly targetted in wide area galaxy surveys. They have been effectively used to study galaxy evolution, cosmology and the thermal history of the Universe. This has been able through the study of their spatial distribution and the shape of the Lyαemission line.

Recent imptovements in instrumentation have revolutionized the kind of studies that can be performed on LAEs. It is now possible to infer detailed kinematic maps for nearby galaxies. The study of these maps would allow us to build data-driven models to interpret the Lyαspectra of unresolved galaxies, helping us to constrain the physical conditions of the interstellar medium (ISM) processing the Lyαradiation.

On the ISM's features that plays an important role in shaping the Ly$\alpha$is HI kinematics. In a static HI medium the Lyαline has two equal and symmetric peaks around the natural Lyαwavelength and zero intensity at the line's center. For an outflowing ISM, the line becomes asymmetrical with a more pronounced read peak. If the galaxy rotates, the line shows different amounts of Doppler shifts modifying the overall line profile Garavito-Camargo et al. (2014).

In this paper we present for the first time a study of the joint effects of galaxy outflows and rotation. We study a simplified geometrical configuration corresponding to an spherical gas cloud with symmetrical radial outflows and a rotation profile corresponding to a solid body.

Djorgovski & Thompson (1992), Rhoads et al. (2000), Gawiser et al. (2007), Koehler et al. (2007), Ouchi et al. (2008), Yamada et al. (2012), Schenker et al. (2012), Kulas et al. (2012), Yamada et al. (2012), Chonis et al. (2013), Finkelstein et al. (2013), Östlin et al. (2014), Hayes et al. (2014), Faisst et al. (2014), Fumagalli et al. (2015).

Our main goal with this work is to measure the effect of the model's physical parameters on the outgoing Lyαline. In this case, due to the resonant[1] nature of the Lyαline, analytical solutions can not be derived. Because of this, it becomes necessary to run simulations that explore and test the model. In this paper we use the radiative transfer code **CLARA** (Code for Lyman Alpha Radiation Analysis) written by Forero-Romero et al. Forero-Romero et al. (2011). CLARA can simulate the Lyαline of a spherical rotating LAE depending on its mass and velocity, so we modify it to include outflows and then we explore the resulting consequences on the Lyαline.

REFERENCES

Chonis T. S. et al., 2013, ApJ, 775, 99
Djorgovski S., Thompson D. J., 1992, in Barbuy B., Renzini A., eds, IAU Symposium Vol. 149, The Stellar Populations of Galaxies. p. 337
Faisst A. L., Capak P., Carollo C. M., Scarlata C., Scoville N., 2014, ApJ, 788, 87
Finkelstein S. L. et al., 2013, Nature, 502, 524
Forero-Romero J. E., Yepes G., Gottlöber S., Knollmann S. R., Cuesta A. J., Prada F., 2011, MNRAS, 415, 3666

[1] Resonant is a common term used in radiative transfer. It means that the photons that create the line are absorbed and re-emitted several times before escaping the cloud of gas.

⋆ je.forero@uniandes.edu.co

Fumagalli M., O'Meara J. M., Prochaska J. X., Rafelski M., Kanekar N., 2015, MNRAS, 446, 3178
Garavito-Camargo J. N., Forero-Romero J. E., Dijkstra M., 2014, ApJ, 795, 120
Gawiser E. et al., 2007, ApJ, 671, 278
Hayes M. et al., 2014, ApJ, 782, 6
Koehler R. S., Schuecker P., Gebhardt K., 2007, A&A, 462, 7
Kulas K. R., Shapley A. E., Kollmeier J. A., Zheng Z., Steidel C. C., Hainline K. N., 2012, ApJ, 745, 33
Östlin G. et al., 2014, ArXiv e-prints
Ouchi M. et al., 2008, ApJs, 176, 301
Rhoads J. E., Malhotra S., Dey A., Stern D., Spinrad H., Jannuzi B. T., 2000, ApJl, 545, L85
Schenker M. A., Stark D. P., Ellis R. S., Robertson B. E., Dunlop J. S., McLure R. J., Kneib J.-P., Richard J., 2012, ApJ, 744, 179
Yamada T., Nakamura Y., Matsuda Y., Hayashino T., Yamauchi R., Morimoto N., Kousai K., Umemura M., 2012, AJ, 143, 79