REPLY TO REFEREE

Dear referee,

First of all we apologize for our delay in replying to the report. We thank you for all your deep and thoughtful comments. We made our best effort to approach them in a very detailed way.

Below we will make a copy of your comments (*in italic*) and a reply to each one of them.

Best regards, The authors

MAJOR COMMENTS:

1/ A strong divergence in the interpretation of the results: *Since rotation has been observed in any kind of astrophysical object, studying the impact of rotation on Lya properties in the context of realistic galaxy conditions is very worth! And the authors achieve nice new results, for the first time: their study nicely demonstrates that rotation does not have a strong impact on the global shaping of the lya emission from galaxies. Even in case of rapid rotation (Vrot = 100 km/s), the global shape of the profile is still set by the radial velocity field (double peaks if static, single red peak if outflow), while optical thickness is setting the scale of the alteration (i.e. the amount of shift and broadening of the peaks). Rotation has subtle effects, at least for the range of parameters investigated here (see major comments 3 and 4), on the depth of the valley and the width of the wings. To my knowledge, these are very interesting results which are demonstrated here for the first time. They would have a strong impact on the community if they were presented this way. However, the authors are not clearly presenting them this way, still trying to find probes of the impact of rotation on observed spectra (but see comments below), which weakens the overall study.*

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+ R: We have changed the perspective our paper. Instead of focusing on
+ finding probes for rotation in current observational data we focus on
+ the ability to include rotational effects using the semi-analytic approach.
+ We keep as clear observational test the spectra taken from different
+ locations in the emitting galaxy.
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2/ Characterisation of the Lya profiles: *I have a concern about the "quantitative results" shown in figs 2,3,4. The authors characterise the lya line shapes by calculating the mean, standard deviation, skewness, and bimodality of the distribution of emergent frequencies. It is surprising, given the complexity of the shape of these distributions. As well described in the text, it is then difficult to relate the values of these estimates to any characteristics of the profile shapes, or to any physical quantities. So is it really useful? For example, the standard deviation would trace the peak's location for a double-peaked profile, whereas it would trace the width of the peak as soon as the distribution becomes single-peaked... So interpreting what a standard deviation of XXX km/s means is not straight-forward if we don't know Vout.*

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+ R: We created these quantitative measurements to compare in an easy way
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+ the semi-analytical model with the radiative transfer simulation.
+ Of course, the line cannot be constrained with a single scalar.
+ One would have to simulateneously use all the three scalars to convey
+ line morphology: standard deviation (changes in width), skewness (changes in
+ symmetry) and bimodality.
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Plus, these collections of 9 small windows are difficult to read and compare. I suggest to try a single large plot instead of nine small ones, with log(\tau_H) in abscisses and the measured quantity in y, and the different values of Vrot and Vout coded by different symbols and colours. For example, for Fig 2, this would better illustrate the fact that the standard deviation, whatever it means, varies by a factor of ~2 when \tau_H varies by one order of mag, whereas it varies by less than 10% when the rotation goes from 0 to 100 km/s, and idem for the impact of outflow velocities.

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+ R: We chose this visualization because we already tried the plot you mention.
+ However the scales are very different, and this way we are only able to visualize
+ the trend in the largest one. So, for each value of tau is hard (and gives no
+ information) to follow the trend in an unified plot. Besides, the comparison
+ against the semi-analytical model gets more complicated. See below how that
+ plot looks like, and why we preferred the image matrix arrangement:
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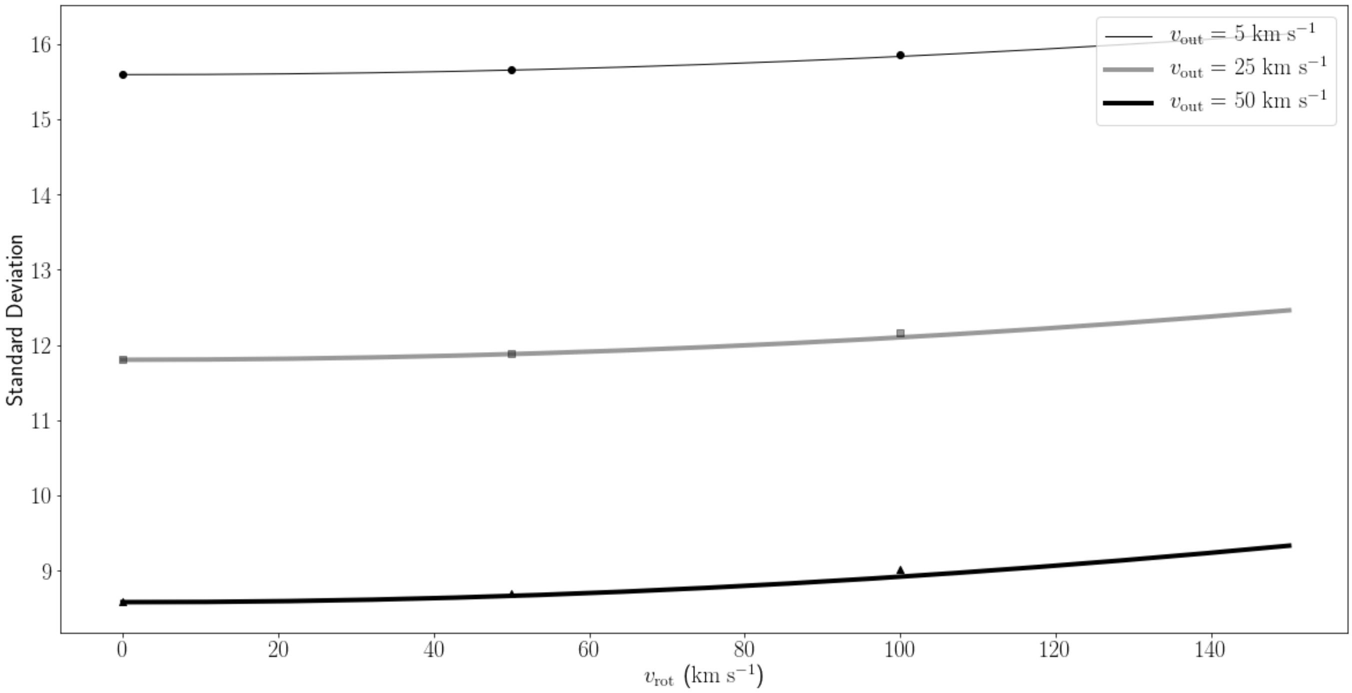

***3/ Thermal Velocity:** There is an important parameter of your models that is not discussed: the effect of varying the thermal velocity vth. Which thermal velocity do you consider in this study ? From what I understand it is fixed to a single value, right ?*

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+ R: Yes, it is fixed to T=10^4 K, i.e. vth = 12.86 km/s. Now it's written down in
the text.
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However, since it appears explicitly in the "smoothing" term of equation (4), depending on the ratio *between Vrot and Vth, the effect of rotation could be drastically different. In fact, this is not the absolute value fo Vrot which is important, but the ratio Vrot/Vth. You should investigate the dependance of the emergent Lya spectra depending on vth, or varying the ratio Vrot/Vth.*

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+ R: We are adding this point of view you present to us in the paper because we
+ agree that to fit observations vth has to be a parameter. However, we stick to
+ it as a fixed value in order to compare the simulation with the semi-analytical
+ model. And in both cases the vth is the same.
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4/ Low optical thickness regimes: *It may be inte_resting to investigate the regimes of low optical thickness, \tau_H~4 or below (corresponding to media transparent to LyC radiation), because that is where the agreement with the analytical solution is not good. In this regime, only numerical simulations can help predicting/understanding the shape of the Lya profiles. And I would imagine that it is also the regime where rotation may have a strong effect, since photons are escaping from the inside.*

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+ R: Indeed, with low \tau_H the semi-analytical model is not good and we mention
it in the paper.
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5/ Spectral resolution: *The rotation broadens the peaks and increases the flux at line center. Spectral resolution would have exactly the same effect on a lya profile. With you study, you could quantify which spectral sampling+resolution is necessary to make sure that the broadening that is observed is not due to a too low spectral resolution.*

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+ R: We have estimated these values by adding a gaussian smoothing to the
frequencies.
+ This is now explained in detail in the new Section 4.1. "The semi-analytic model
as a gaussian smoothing"
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_6/ triple-peaked lya profiles as proof of rotation ? The authors discuss that two lya triple-peaked spectra could be shaped by rotation: Tol1214-277 and the Sunburst. Both have new, complementary observations not easily compatible with rotation as the main driver for their Lya shape.

** Tol1214-277 The very peculiar shape in the low resolution GHRS lyman-alpha spectrum of Tol1214-277 was modelled by the authors with a rotating model (Forrero+18). However, it has been recently re-observed with COS, and shows a normal double-peaked spectrum finally, as was shown by Goran Ostlin in the conference in Tokyo last month:
http://www.icrr.u-tokyo.ac.jp/~toshijun/SakuraCLAW/slides/ostlin_CLAW.pdf

The weird triple-peak in the GHRS spectrum was probably due to low spectral resolution and poor S/N. The valley in the higher spectral resolution, higher signal to noise, spectrum goes to zero. Rotation may not be necessary anymore to explain this kind of profile, although the broad wings are not well reproduced by expanding shell models, maybe better by clumpy outflows, as shown in the slides from Ostlin._

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+ R: We have removed the observational especulation about  Tol1214-277.
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- [Jaime: Re-escribir para decir que no es necesario.]
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*** The Sunburst Arc This is the only other triple peak even reported in the literature, as far as I am aware (Rivera-Thorsen+17). This profile was suggested as tracing LyC escape by Rivera+17, and new observations have just been done with HST, it is nicely detected in LyC emission. I saw the data from a colleague of mine, they will be published soon. So for this object either, rotation may not be the main driver of the weird Lya shape.*

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- We have removed the observational especulation about  The Sunburst Arc.
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MINOR COMMENTS:

7/ Abstract: *What are the physical arguments for the range of the parameters that you chose? Which kind of galaxies are you thinking of? In particular, the rotational velocities seem on the high end of what is observed, or correspond to massive objects, which are usually not strong Lya emitters. On the other hand, outflow velocities are rather low compared to the observed velocities from absorption lines studies. I understand that it corresponds to cases where the effect of rotation is expected to be maximal, but it would be useful to comment on these values, to put them into context.*

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+ R: We explore a range of parameters convenient for model comparison (MC vs. semi-analytic) and
+ that produce an standard deviation and skewness similar to observational MUSE values.
+ The values for the outflow velocity are lower than values commonly used in the
+ literature to allow for an interplay between the two kinematic features.
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8/ Intro: *In the introduction, the authors try to motivate why it is important to study Lya radiation transfer in rotating systems. I think it is very important, but I don't find the argumentation convincing so far. To my knowledge, there is a single study so far investigating a possible link between the escape of Lya radiation from galaxies and their kinematics, from the LARS team (Herenz+16). They report that Lya is escaping preferentially from systems which are dispersion dominated, so it seems that rotation does not help to be a strong LAE, although their sample is quite small (~12 galaxies). And the same with mass: low mass galaxies may not be often seen in rotation. Although big spiral galaxies of the local Universe are nicely rotating, the point of view that is presented in the introduction, i.e. the fact that compact dwarf galaxies are rotationally supported, is not main stream. Actually, in the cited study from Cairos+15, 4 out of 8 galaxies show no sign of rotation: they have very irregular velocity maps. There are other IFU studies of 4 "green peas"-like* *galaxies, called 'super compact UV bright galaxies', from Basu-Zych+09, and 19 LBAs from GonÃ§alves+10, where they report mainly perturbed, irregular kinematics. Finally, recent studies at high redshift also report a low fraction of disks at low mass, e.g. 25% only for Girard+18. From my point of view, Lya emitters are usually low mass, and they are also usually dispersion dominated systems. Studying the effect of rotation on Lya radiation transfer is an interesting study, however, he argumentation in the introduction is not very convincing so far. I would suggest to find another angle, or to be more careful in the statements: e.g. although most LAEs may not be rotation dominated systems, rotation is a generic effect of gravitation. Idealised models with more and more complicated geometries are investigated, but they all neglect rotation: there is a severe lack of studies of the effect of rotation on the shape of the Lya lines... etc....*

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+ R: The introduction has a new paragraph that emphasizes the model comparison (RT
vs. semi-analytic.)
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9/ First paragraph, ligne 8: *these systems naturally show a Lya emission line -> say 'produce' instead of 'show', since not all the star-forming galaxies with neutral gas and low dust content show Lya in emission, whereas they produce a lot (not IZwicky18 for example).*

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+ R: Fixed.
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10/ 4th paragraph, last sentence: *The citation of Yamada+12 is irrelevant here, since these are observations, not radiation transfer studies.*

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+ R: Fixed.
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11/ Theoretical Models: *Once again, the choice of the range of outflowing velocities is surprisingly low (Vout = 0,25,50 km/s) compared to the several 100s of km/s usually measured from absorption line studies (e.g. Henry+15, Alexandroff+15, Chisholm+15,16,17, Rivera-Thorsen+17). On the other hand, the rotation velocities are high compared to values measured typically in IFU/IFS observations (Cairos+15, Basu-Zych+09).*

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+ The values for the outflow velocity are lower than values commonly used in the
+ literature to allow for an interplay between the two kinematic features.
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12/ 4.2 spatial variation of the profile on Fig6: *The authors make a nice prediction for a spatial variation of the lya profile emerging from a rotating cloud, which is a strong prediction of their model, and may be observable with MUSE or other IFU in the near future, but which spectral resolution would be necessary to distinguish between the red side and blue side spectra ? About lya kinematic maps, the authors cite observational studies of Lya blobs (Prescott+15, Arrigoni+18) which may be of different nature than the lya halos observed around "normal" galaxies with MUSE (Wisotzki+16, Leclercq+17). In particular, Patricio+16 show a lya kinematic map of the Lya halo of a lensed galaxy observed with MUSE, and find no spatial variation of the lya profiles, but the spectral* *resolution of MUSE may not be sufficient to see the predicted effect.*

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+ We comment on the effect of a gaussian smoothing and required spectral resolution.
+ We also highlight that the distance between peaks shouldn't depend on that kind
of gaussian smootthin.
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13/ 4.3 comparison with MUSE-Wide: *I am not sure to understand Fig7, why do you find that ~half of the sample has a positive skewness ?! Once again, this is not straightforward to understand the meaning of these quantities for complicated and very inhomogeneous distributions as lya spectra are, but you say in the text that a positive skewness is due to spectra with a prominent blue peak. The MUSE-Wide LAE sample does NOT have half of the lya spectra blue shifted. can you check/explain how you derived this quantity on the observed spectra ?*

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+ We have removed the comparison with MUSE-Wide.
+ However, in this case the positive skewness
+ is not due to a prominent blue peak, it's due to a blue-assymmetry of the single
emission peak.
+ The MUSE-wide spectra do not have information about the line center, so the
skewness cannot measure
+ the asymmetry around the line center, only a global asymmetry.
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