

CURRENT STATUS OF FAT

P. KAMPHUIS

1. INTRODUCTION

This document provides an overview of the current version of FAT related to the tests provided in Kamphuis et al. (2015). It merely consist of a set of figures which are described in said paper. Typically the current version works much better then the version from 2015. However, as we have also reduced the applied errors these plot show that performance is comparable, i.e. the fits are equally accurate with smaller errors. There is however in this new version an issue with the center being offset from the actual center by roughly 10% of the FWHM of the beam. It is currently unclear where this difference comes from. As FAT now employs a Monte Carlo method in the regularisation of the parameters the final model can sometimes differ slightly. However this should always be within the calculated errors. If not please open an issue on the GitHub.

2. LVHIS GALAXIES

This section shows Figures 7, 11 and 12 from Kamphuis et al. (2015).

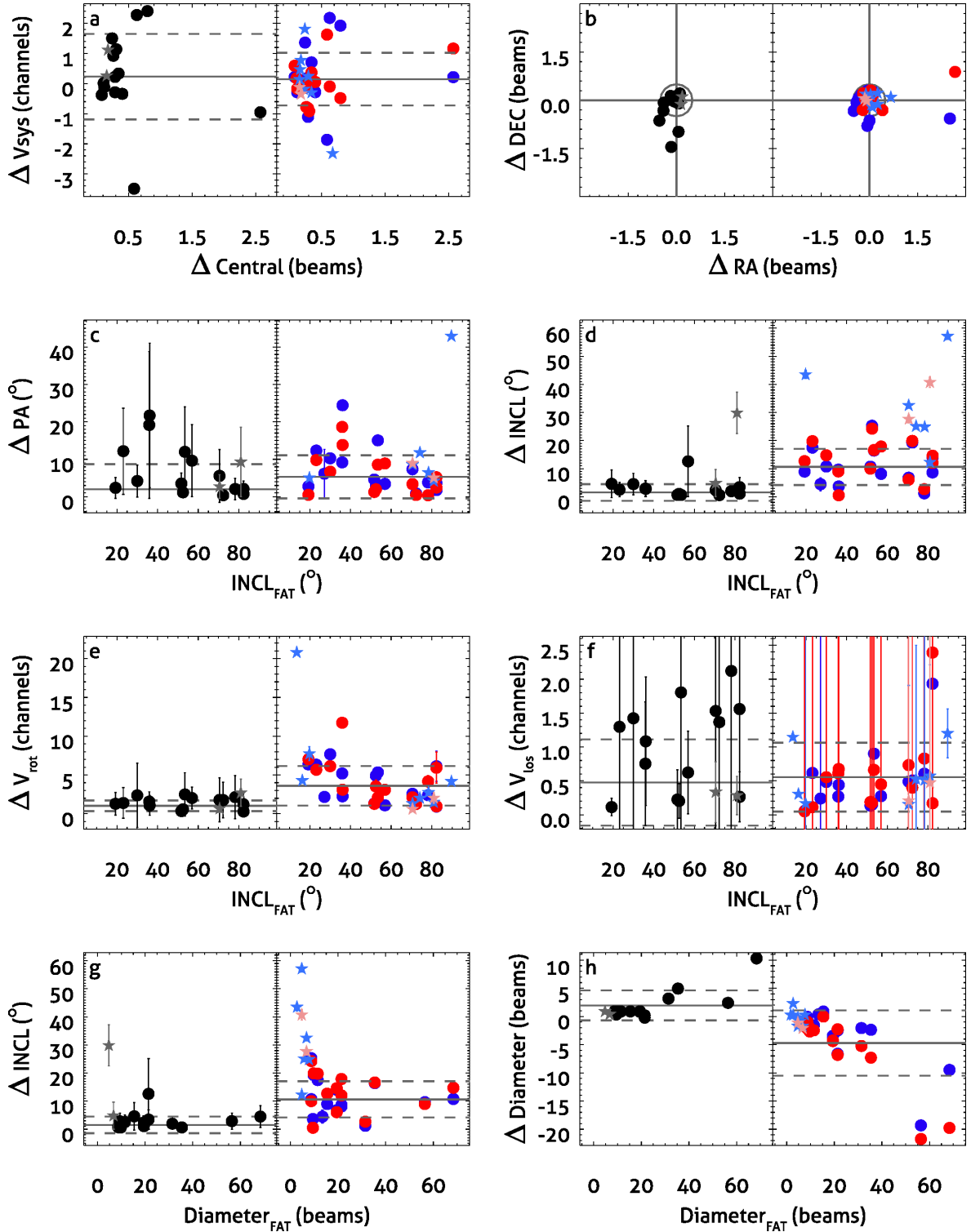


FIGURE 1. Differences between the final fits with FAT, ROTCUR and DISKFIT. Left hand side of each panel: the difference between ROTCUR and DISKFIT, i.e. ROTCUR - DISKFIT, Right hand side of each panel: blue: the difference between ROTCUR and FAT, red: the difference between DISKFIT and FAT. The solid grey lines show the weighted average and the dashed lines show the 1σ deviation from this average in each plot. Stars correspond to final fits outside the previously determined reliable range (see Section ??) and circles to ones inside these limits. The errors on the points are calculated as the average of the error for all rings divided by \sqrt{N} with N the number of rings in the model. This is Figure 7 from Kamphuis et al. (2015).

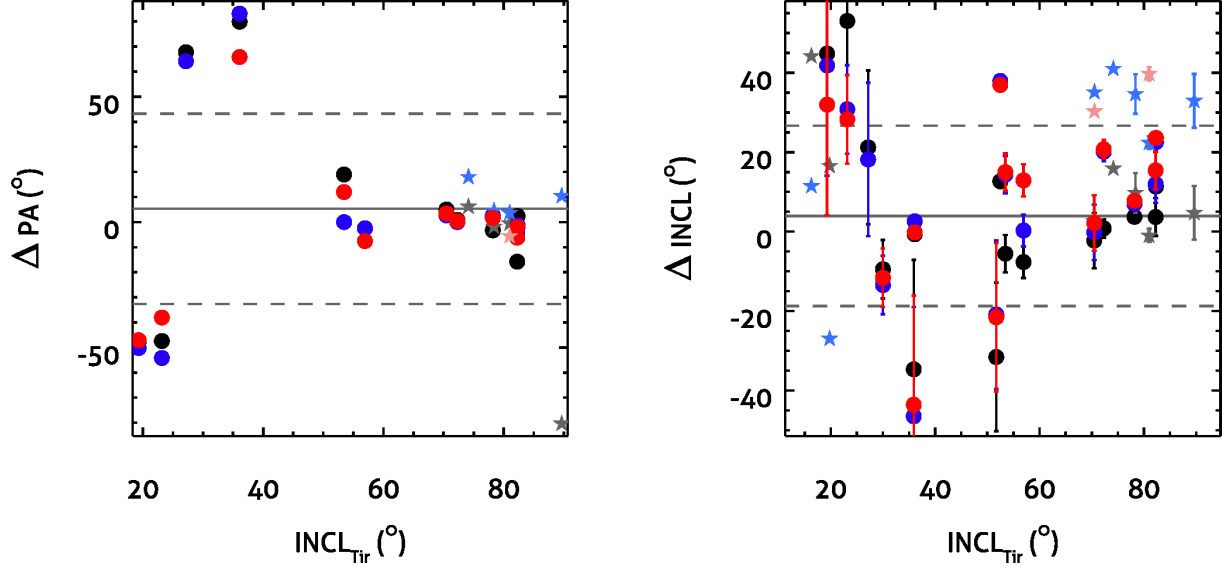


FIGURE 2. Comparison between the PA and inclination of the optical values and the different fits, black - FAT, blue - ROTCUR, red - DISKFIT. Stars are galaxies where the final FAT model is in a part of parameter space that is considered unreliable. The grey dash line denote the scatter on the deviations between literature and the ROTCUR interactive fit. This is Figure 11 from Kamphuis et al. (2015).

3. ARTIFICIAL GALAXIES

This shows the results on the set of Artificial Database as described in Kamphuis et al. (2015).

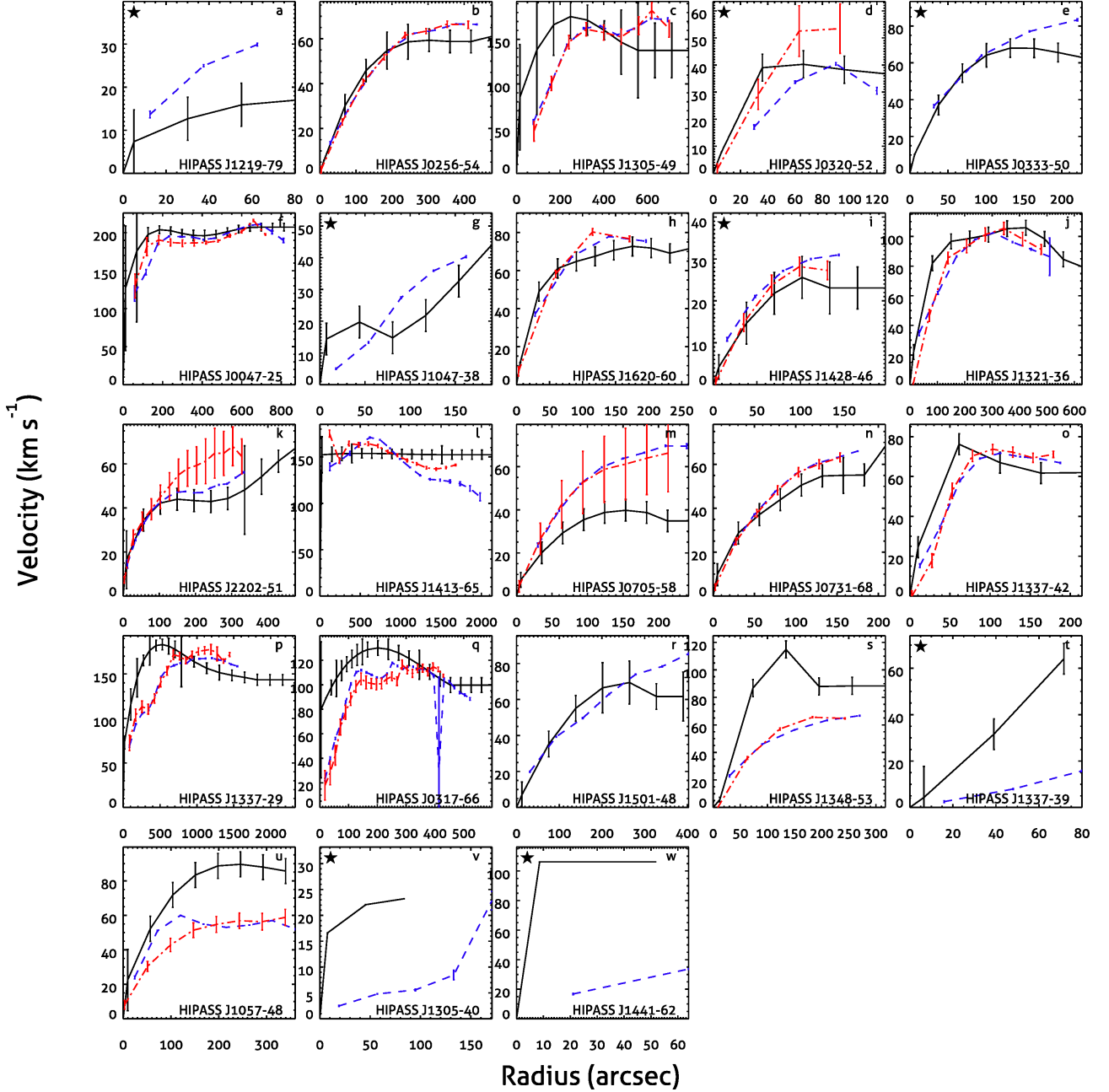


FIGURE 3. Rotation curves for all the galaxies in the LVHIS Sample. The plots are ordered according to their FAT inclination, with the lowest inclination in the bottom left. Black lines: FAT, Red Lines: DISKFIT, Blue lines: ROTCUR. The error bars are the formal errors derived by DISKFIT and ROTCUR for the red and blue lines respectively. For FAT the error is an empirical estimate derived from the regularisation process (see § ??). Stars indicate curves outside the reliably fitted range. This is Figure 12 from Kamphuis et al. (2015).

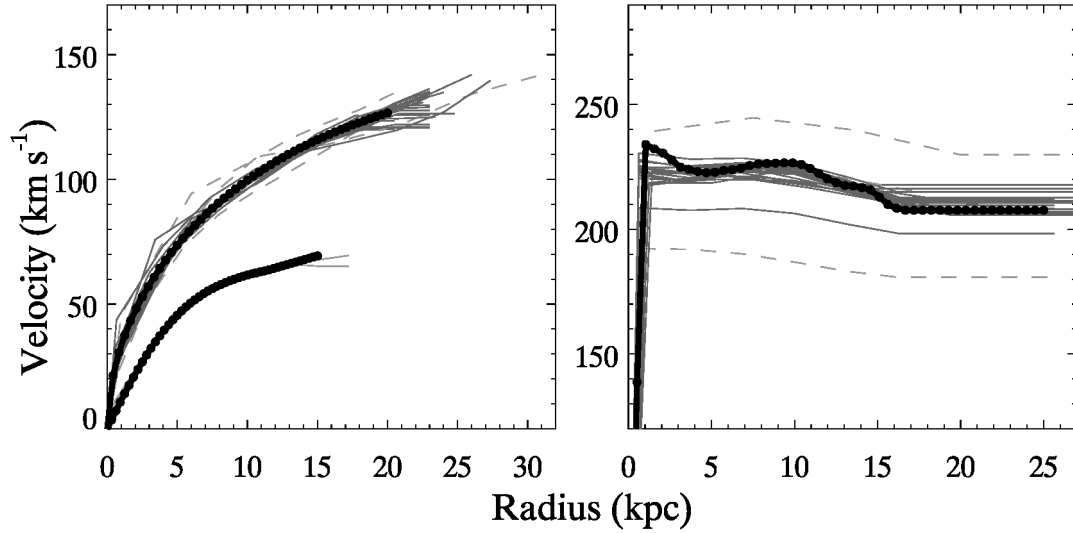


FIGURE 4. Rotation curves used and fitted in the artificial galaxy database. Left panel: dwarf galaxy and intermediate galaxy. Right panel: massive galaxy. The black circles and lines indicate the input rotation curves, grey solid lines are the reliable output curves, grey dashed lines are from artificial galaxies outside the reliable fitting range. Figure 4 in Kamphuis et al. (2015)

4. EXTENDED ARTIFICIAL GALAXIES

This shows the results on an extended set of Artificial Database as described in Kamphuis et al. (2015). Typically these galaxies are warped as opposed to flat and they explore a range of different resolutions. Table 1 is a copy of Table one in Kamphuis et al. (2015) for this extended set of galaxies.

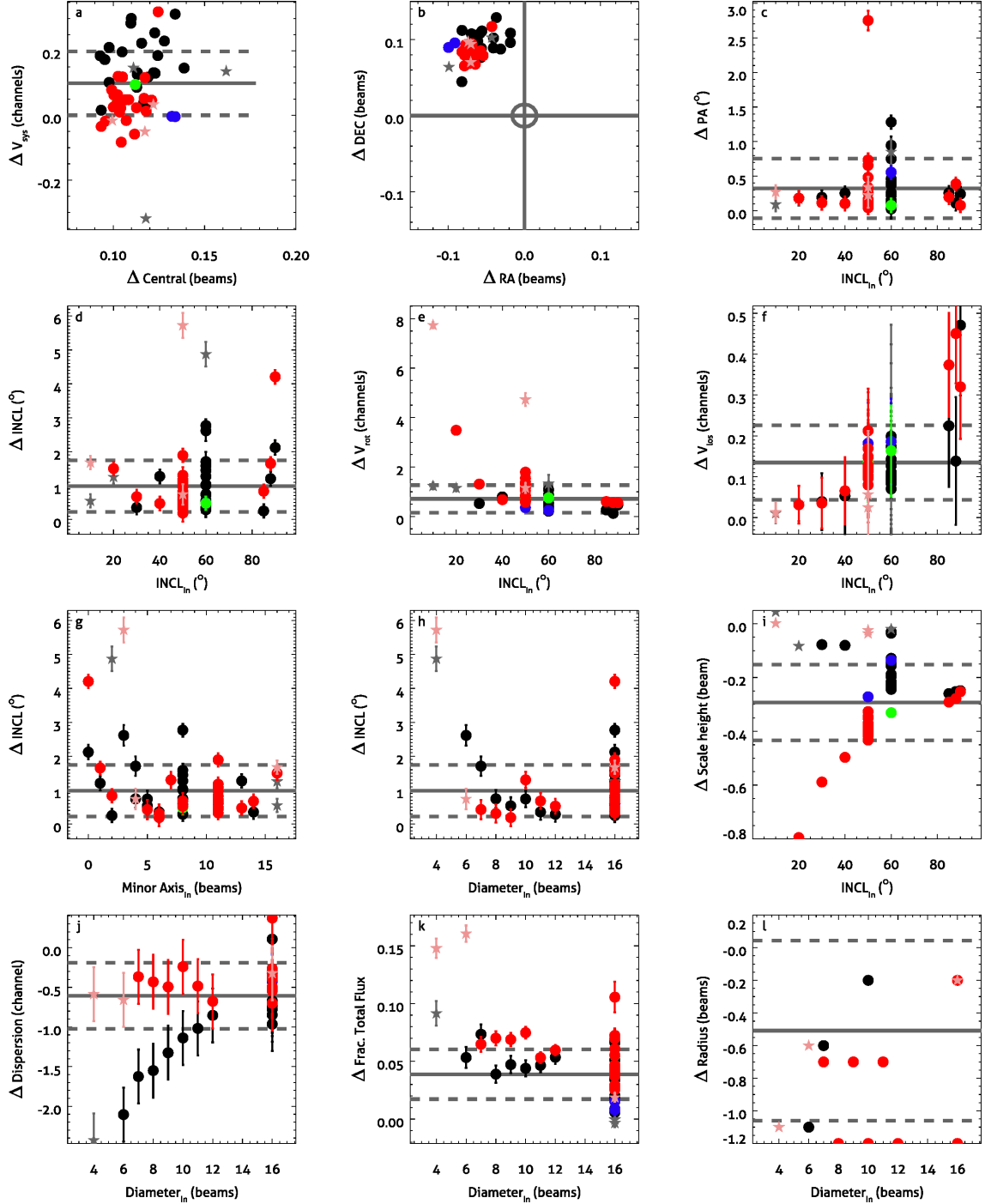


FIGURE 5. Difference between the artificial galaxy inputs and FAT output. On the y-axis the difference between the model input and best fitting FAT values is shown for various parameters. The solid line shows the mean deviation over the whole sample and the dashed lines show the 1σ offsets from this average. The errors on the points are calculated as the average of the FAT error for all rings divided by \sqrt{N} , where N is the number of rings in the model. The stars show galaxies outside the reliable range for FAT whereas circles are inside this range. The colour coding indicates: blue - dwarf galaxy, black - intermediate galaxy, red - massive galaxy. Figure 6 in Kamphuis et al. (2015)

Parameter	Database Galaxies		Variations
	Base 1	Base 2	Sample Values
Beams across the major axis	16	16	32
Inclination ($^{\circ}$)	60	50	-
PA ($^{\circ}$)	45	55	-
Inner-Outer Dispersion (km s^{-1})	8.0-8.0	8.0-8.0	-
Inner-Outer $\Delta \theta$ (rad)	0-0.05	0-0.05	0-0.15
Inner-Outer $\Delta \phi$ (rad)	0-0.2	0-0.2	0-0.05
Inner-Outer scale height (kpc)	0.3-0.3	0.2-0.2	-
Channel width (km s^{-1})	2	2	4, 8
Signal-to-Noise	8	8	-
Rotation Curve	intermediate	massive	-

TABLE 1. Values for the two base galaxies (columns 2 & 3) and the values by which they are varied (column 4). We change only one parameter at a time while all other parameters for the base galaxies are unchanged.

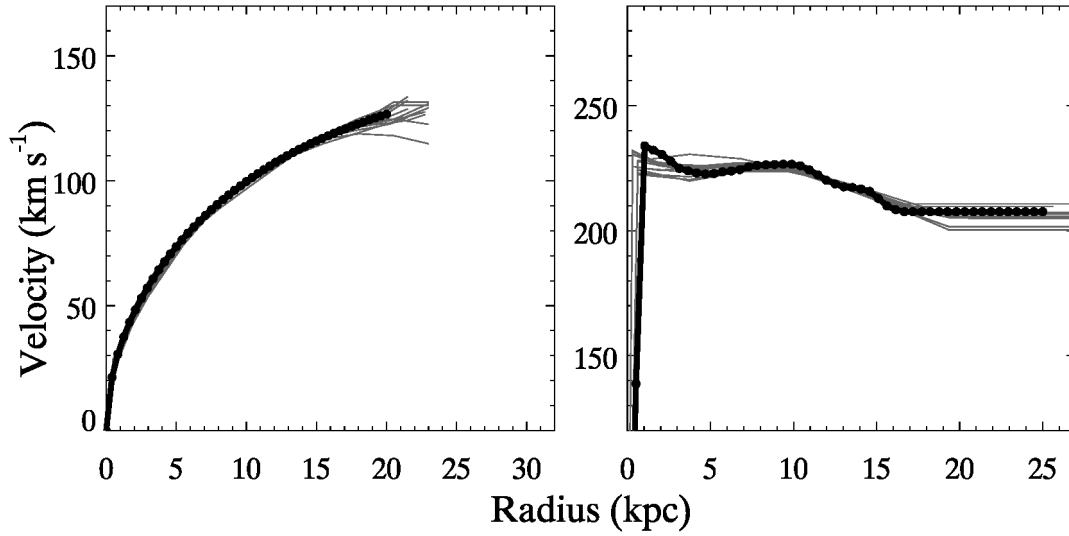


FIGURE 6. Rotation curves used and fitted in the artificial galaxy database. Left panel: dwarf galaxy and intermediate galaxy. Right panel: massive galaxy. The black circles and lines indicate the input rotation curves, grey solid lines are the reliable output curves, grey dashed lines are from artificial galaxies outside the reliable fitting range. Figure 4 in Kamphuis et al. (2015)

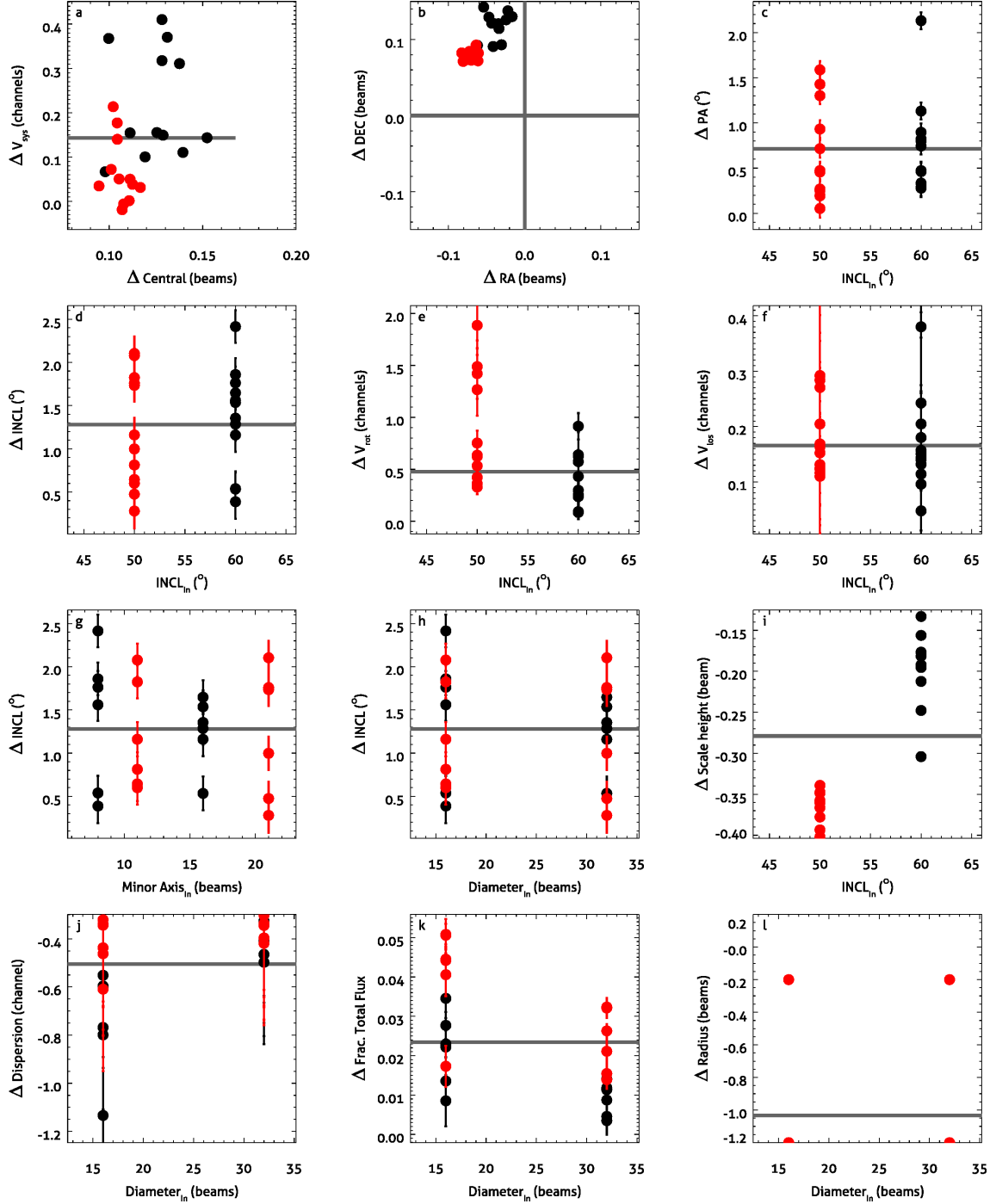


FIGURE 7. Difference between the artificial galaxy inputs and FAT output. On the y-axis the difference between the model input and best fitting FAT values is shown for various parameters. The solid line shows the mean deviation over the whole sample and the dashed lines show the 1σ offsets from this average. The errors on the points are calculated as the average of the FAT error for all rings divided by \sqrt{N} , where N is the number of rings in the model. The stars show galaxies outside the reliable range for FAT whereas circles are inside this range. The colour coding indicates: blue - dwarf galaxy, black - intermediate galaxy, red - massive galaxy. Figure 6 in Kamphuis et al. (2015)