HI content of massive red spiral galaxies observed by FAST

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Outline

- Introduction: massive red spirals

- FAST observation

  - 6 test galaxies: by FAST vs. ALFALFA

  - Results of 113 massive red spirals observed by FAST

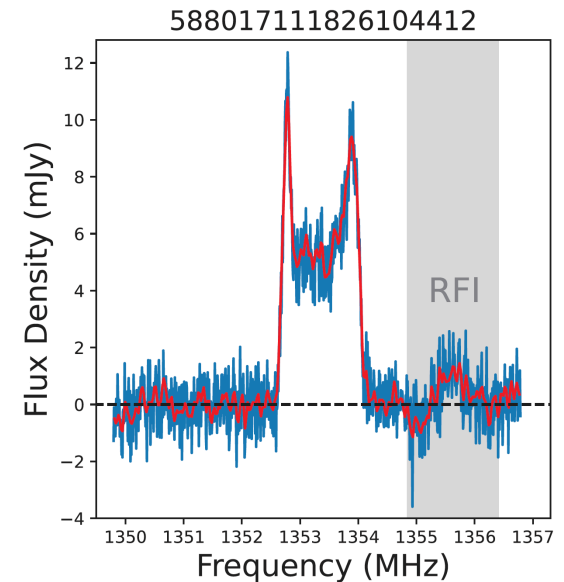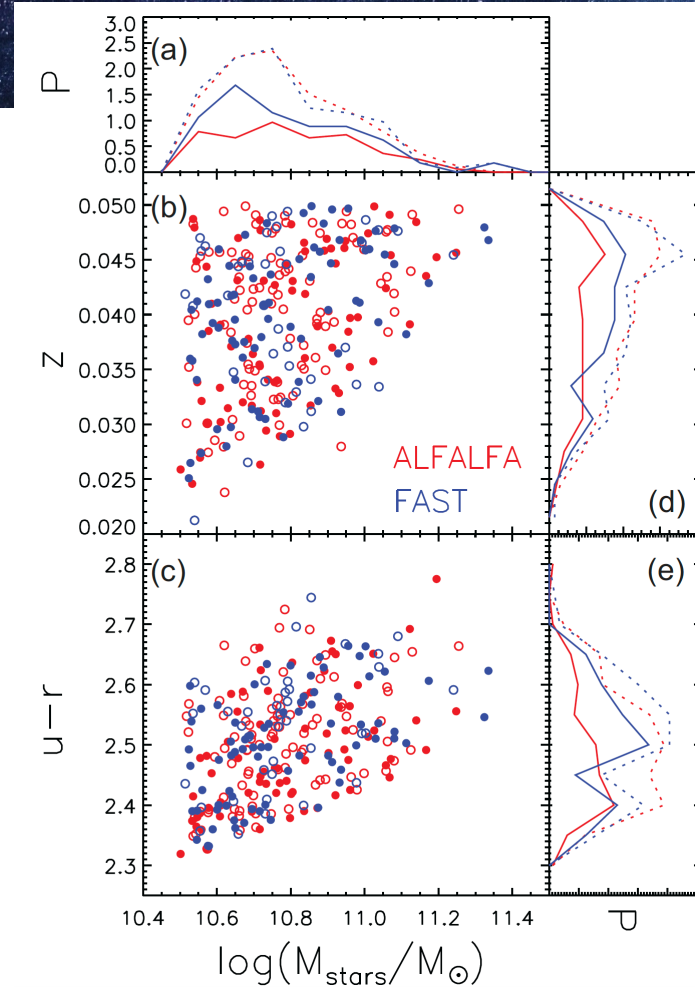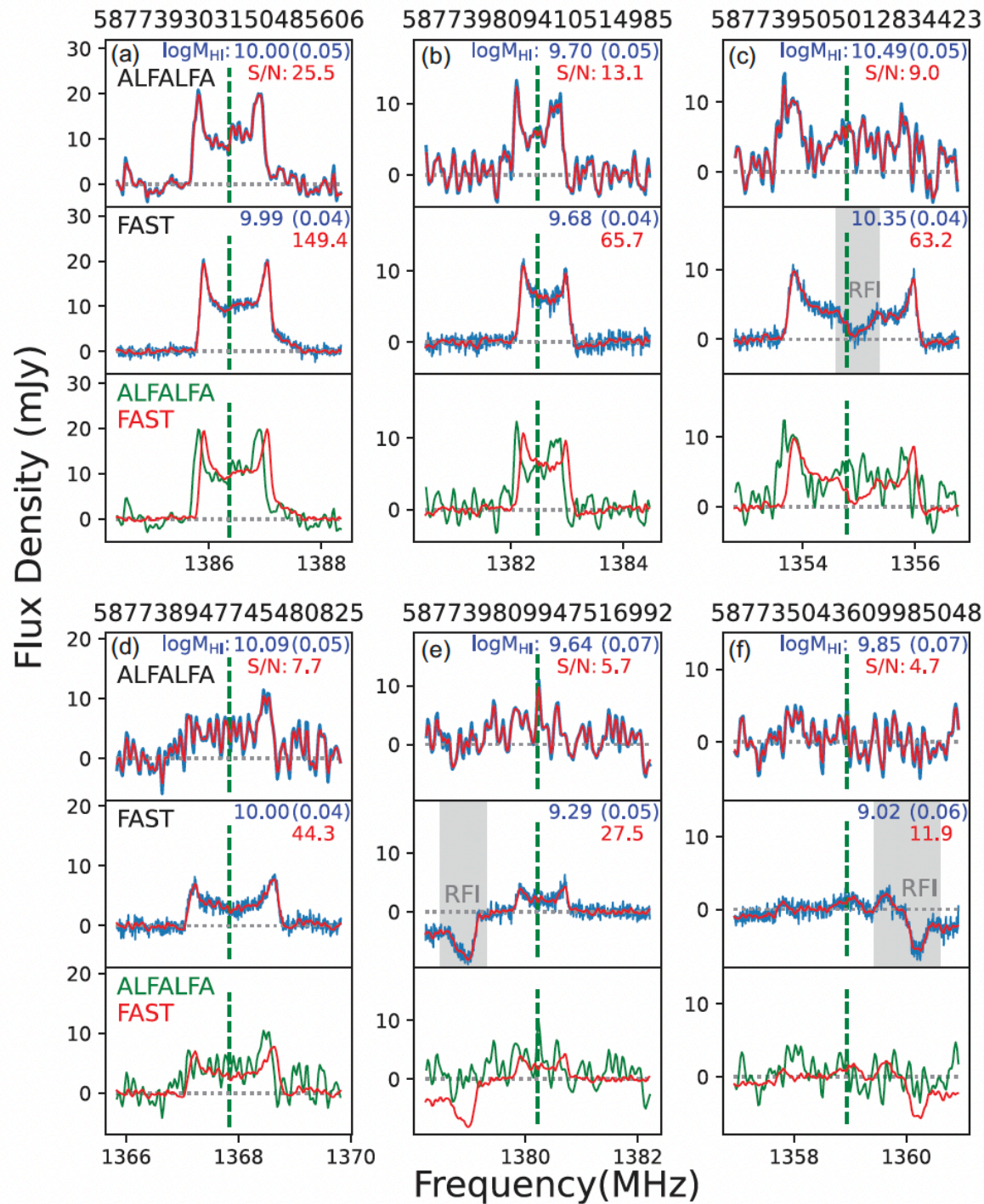- Color profile: 279 massive red spirals

Guo et al. 2020: red spirals with $M_{stars} > 10^{10.5} M_{sun}$ in SDSS DR7
- red & blue spirals: similar HI mass
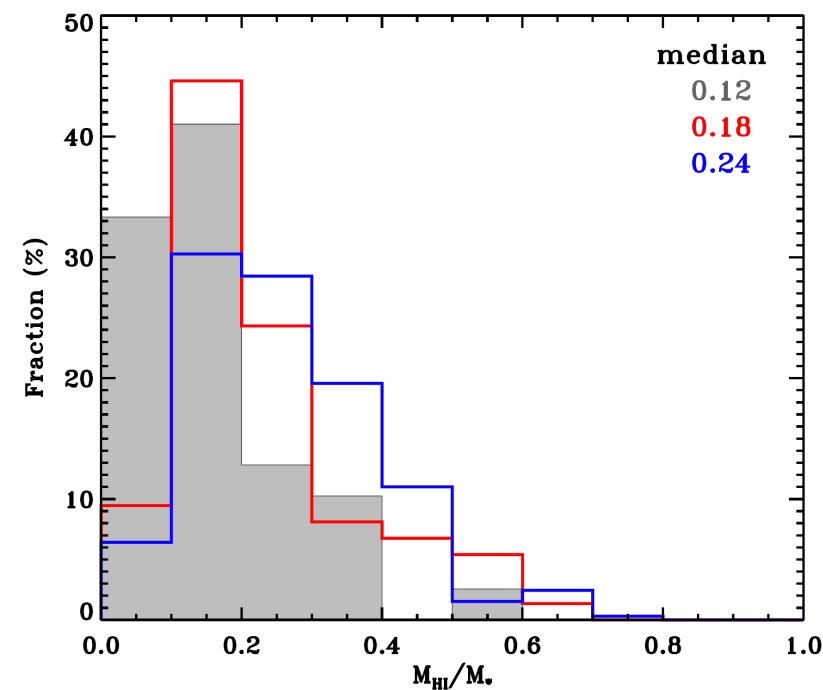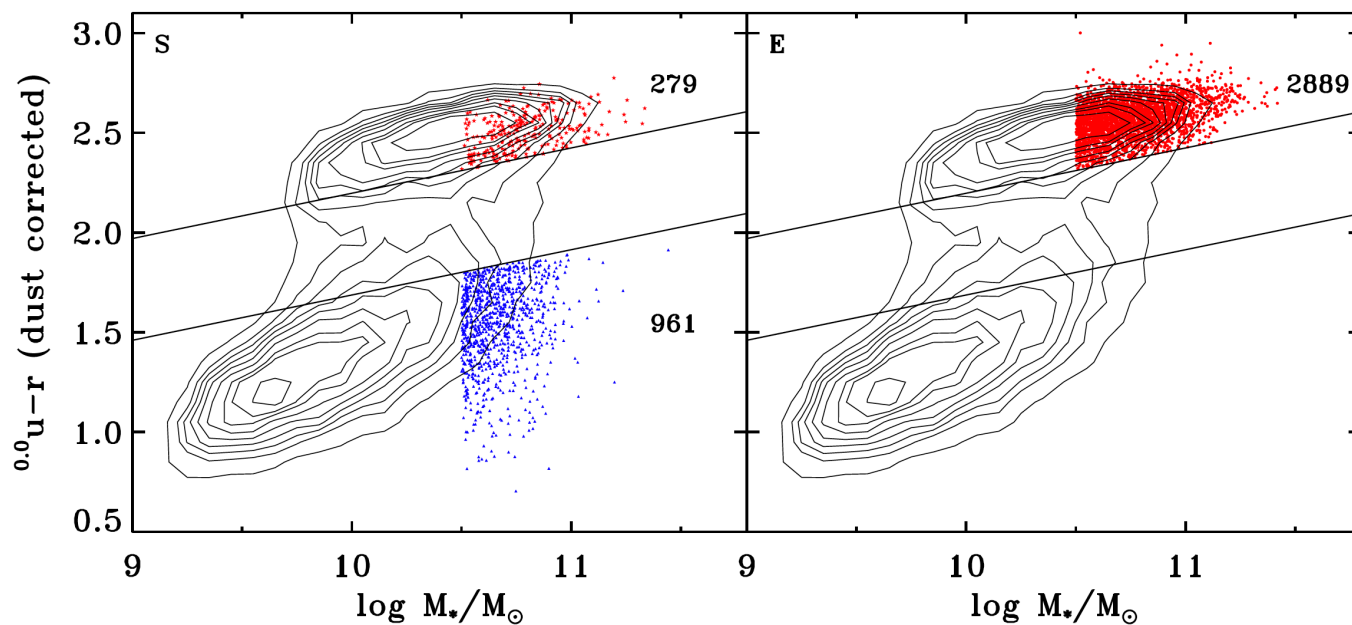
Sample

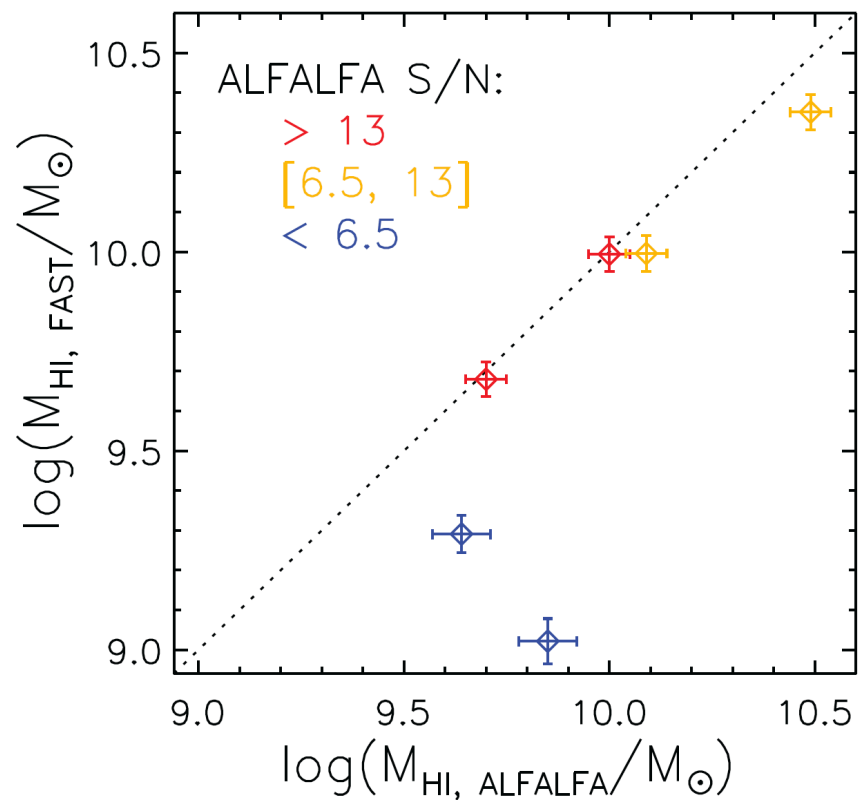- 279 massive red spirals selected by *Guo et al. 2020*

- 166 observed by ALFALFA

- 113 proposed to be observed by FAST (project ID: 2019a-133-O)

  - ON-OFF mode

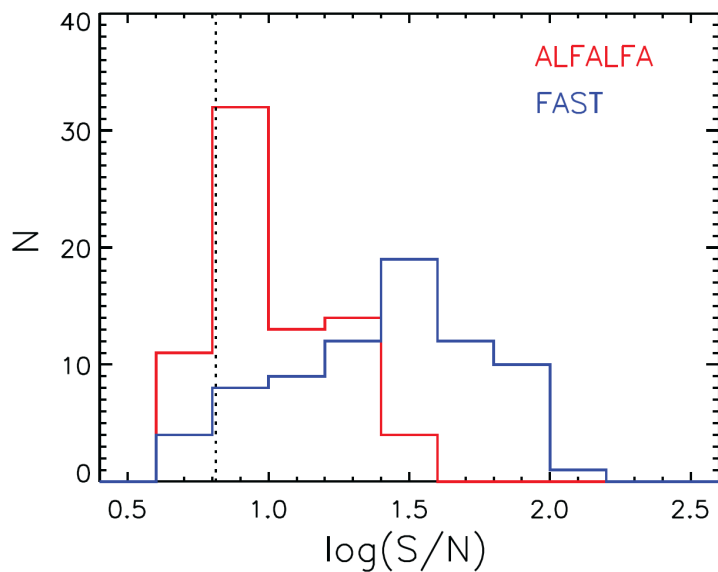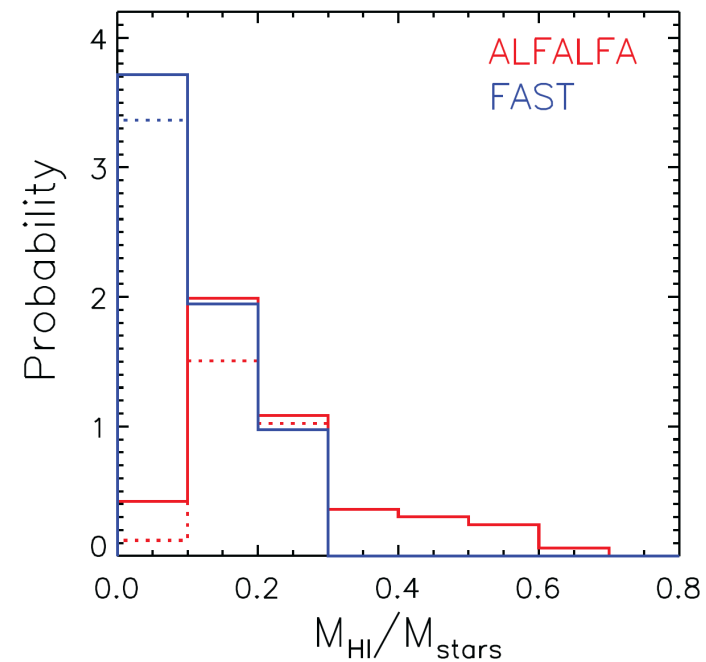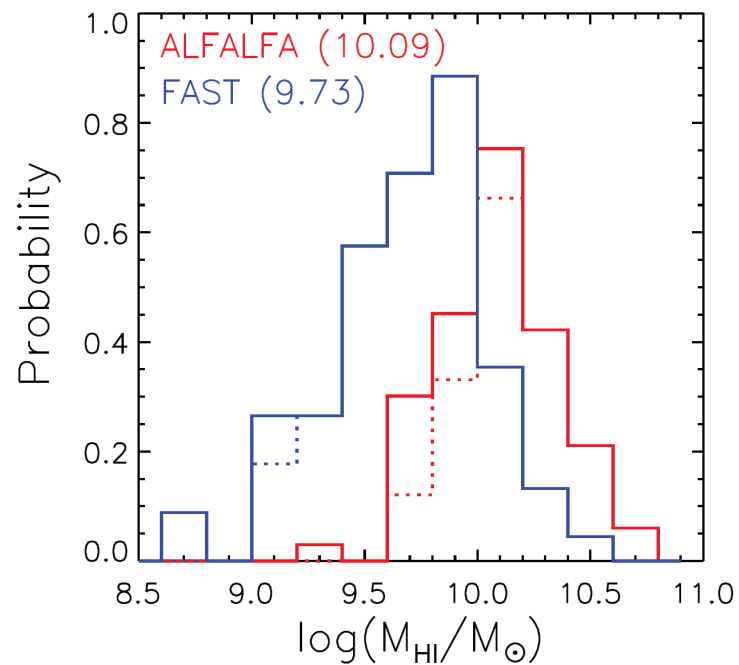 - ON: 45s (M01) / 240s (M01+M14)

- 6 test galaxies:

ALFALFA vs. FAST

	All red spirals	S/N > 6.5	S/N > 4.7
ALFALFA	166	60 (36.1 per cent)	74 (44.6 per cent)
FAST	113	71 (62.8 per cent)	75 (66.4 per cent)

Results available online

Table 1. Results of the 113 massive red spirals observed by FAST. 10 galaxies are listed below and the full table is available online.

objID (1)	ra (2)	dec (3)	z (4)	$W_{50}(\mathrm{km\,s^{-1}})$ (5)	$\sigma_{\mathrm{rms}}(\mathrm{mJy})$ (6)	S_{21} $(\mathrm{Jy\,km\,s^{-1}})$ (7)	$\log(M_{\mathrm{H\,I}}/M_\odot)$ (8)	$\sigma_{\log M_{\mathrm{H\,I}}}$ (9)	S/N (10)
587725774534148388	122.377	47.7896	0.0408		0.41				
587728679539245209	170.779	65.2518	0.0476	253	0.40	0.70	9.85	0.05	24.9
587727229986078786	26.444	−9.7429	0.0494	10	0.46	0.03	8.44	0.12	3.9
587727178981769320	349.363	−10.0307	0.0336		0.54				
587730845817504193	321.890	−1.1886	0.0305	298	0.42	2.61	10.03	0.04	79.6
587725816408768584	158.830	64.1775	0.0411	176	0.41	0.14	9.02	0.09	5.8
588009366404726908	157.984	59.0177	0.0458		0.34				
587727180610338874	30.955	−8.1289	0.0413	75	0.44	0.17	9.11	0.06	10.0
587731511536976010	30.033	−1.0156	0.0404	266	0.45	1.40	10.00	0.04	42.7
588015507667353745	19.634	−1.1974	0.0468	91	0.45	0.54	9.72	0.05	28.4
−									

Notes. Columns: (1) SDSS object ID, (2) and (3) coordinate of the galaxy, (4) spectroscopic redshift of the galaxy, (5) velocity width of the H I profile, (6) rms noise of the spectrum, (7) rest-frame velocity-integrated H I line flux, (8) H I mass of the detection, (9) uncertainty of H I mass, (10) S/N of the detection.
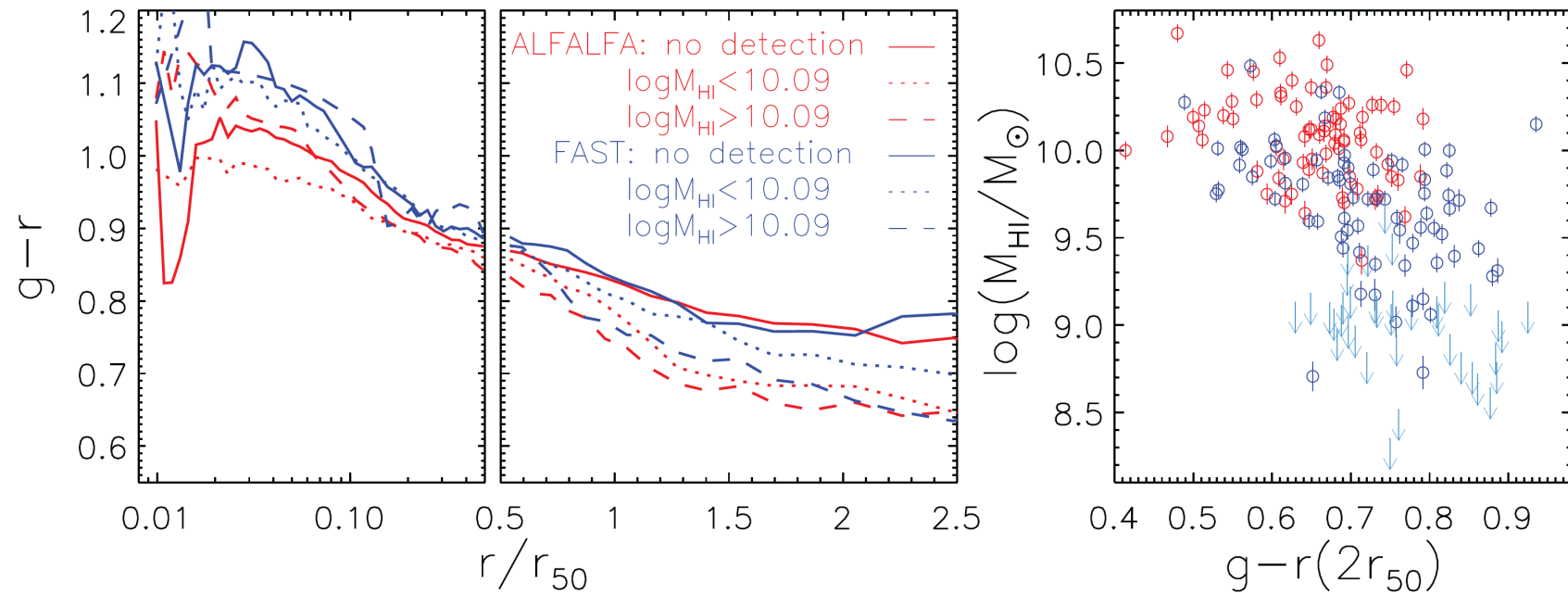
Color profile

279 massive red spirals

- DESI image survey

- Galaxy image
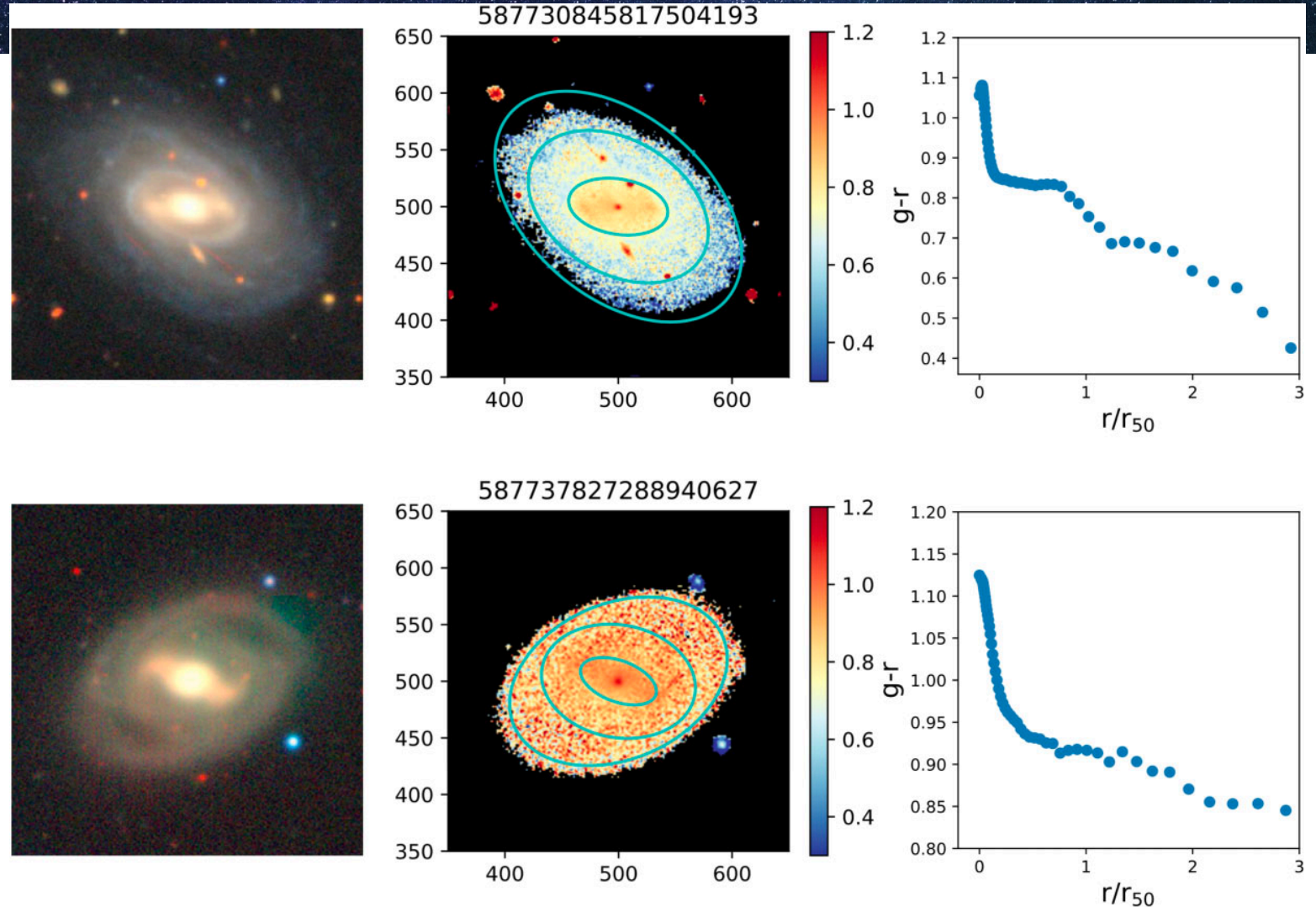
- Color profile

- Galaxies with higher HI mass have bluer outer disk
- Optically selected massive red spirals are not fully quenched
- UV-optical/NUV-r color (*Cortese 2012; Cortese et al. 2020; Zhou et al. 2021*)

Conclusion

- HI content of 113 massive red spirals observed by FAST： compared with ALFALFA， FAST data has higher detection rate, with higher S/N

- DESI image survey is used to check image properties and color profile of these massive red spirals: galaxies with higher HI content have bluer outer disk.

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- — to investigate further the NUV-r red spirals with HI detection