Searching 21-cm Absorption Systems in Chinese Radio Telescopes

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Abstract Neutral hydrogen clouds are known to exist in the Universe, however their spatial distributions and physical properties are poorly understood. Such missing information can be studied by the Chinese new generation radio telescopes by a blind searching of 21-cm absorption systems. We forecast the abilities of surveys of 21-cm absorption systems by two representative radio telescopes – Five-hundred-meter Aperture Spherical radio Telescope (FAST) and Tianlai. The result shows that, in a few of years term, these telescopes with either high sensitivity (FAST) or wide field of view (Tianlai) can discover orders of magnitudes more 21-cm absorption systems, than the cumulative discoveries in the past 50 years.

Key words:

1 INTRODUCTION

21-cm absorption systems can be used to directly measure the cosmic acceleration via Sandage-Loeb (SL) effect (Sandage 1962; Loeb 1998). The current best constraint of this acceleration if given by Darling (2012). A proposal on CHIME-like telescope is given by Yu et al. (2014), in which the minor redshift drift could be measured over decades. The uncertainties are from the poorly understood neutral hydrogen clouds. Path finder surveys, taking less than a year, are needed to improve our understandings of spatial distribution and physical properties of neutral hydrogen clouds. This can be done by the Chinese new generation radio telescopes – Five-hundred-meter Aperture Spherical radio Telescope (FAST) (Li & Pan 2016) and Tianlai (Chen 2012).

2 SENSITIVITY

NRAO VLA Sky Survey (NVSS)[1].

[1] http://www.cv.nrao.edu/nvss/

Recent studies show that the number density of absorbers to be $\mathrm{d}N/\mathrm{d}z \sim 0.45$ (Wolfe et al. 2005; Zwaan et al. 2007).

Recent discoveries of 21-cm absorption systems have about 20% fractional depth (Allison et al. 2015; Zwaan et al. 2015).

3 FAST ESTIMATION

Parameters:

Result: 90 per month.

4 TIANLAI ESTIMATION

Parameters:

Result: 80 per year.

5 CONCLUSION

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