ASKAP-FLASH: probing HI in galaxies at 0.5 < z < 1

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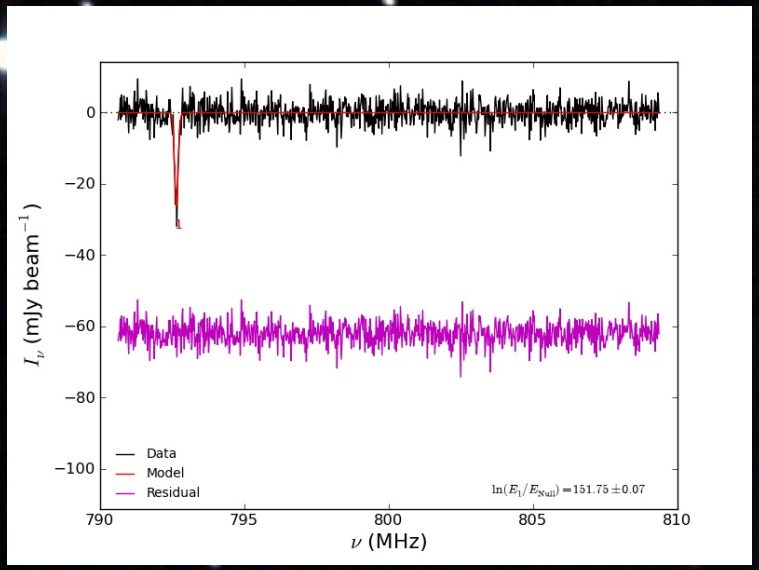
on behalf of the ASKAP-FLASH team



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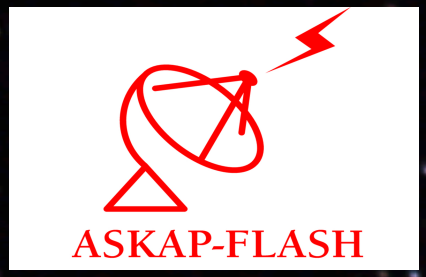


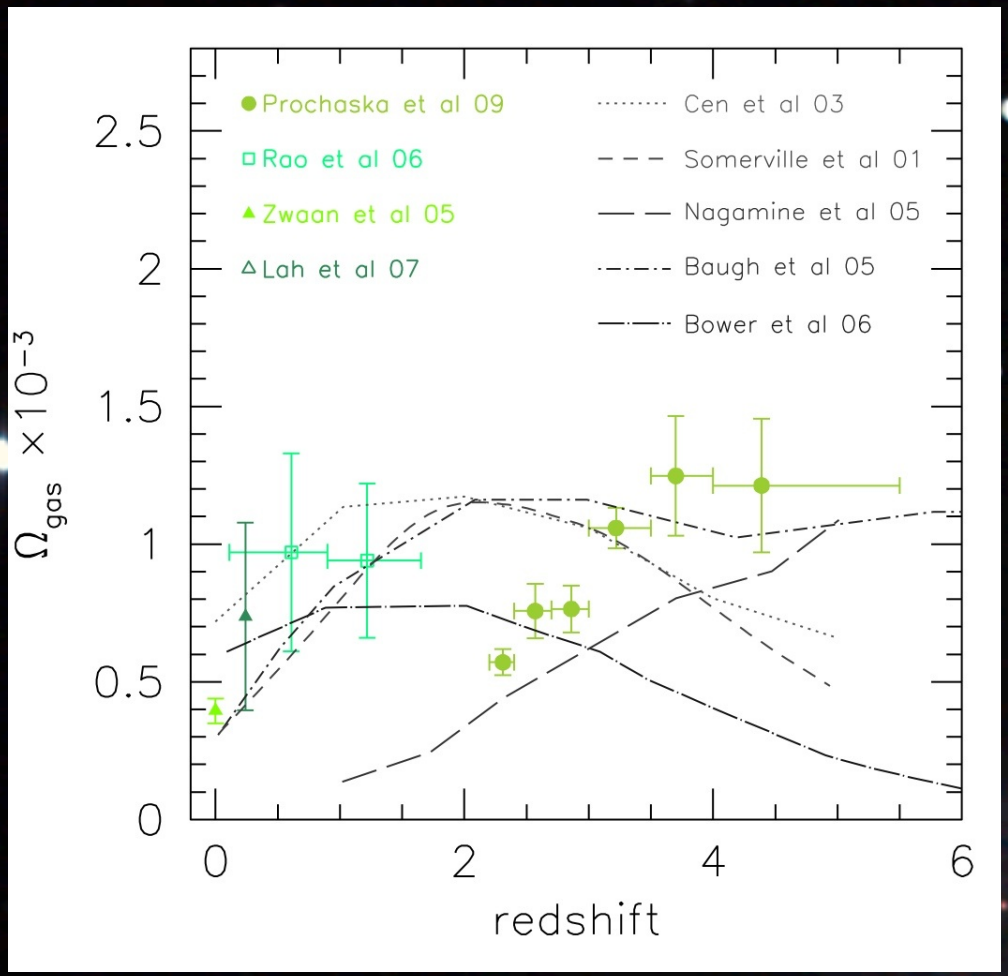
FLASH: the First Large Absorption Survey in HI

Key science goals:

- To provide the *first systematic probe* of the neutral hydrogen (HI) content of individual galaxies in the redshift range $0.5 < z < 1.0$
- To make *tests of current galaxy evolution and mass assembly models* in this redshift range, using the observed and predicted distributions of quantities like HI optical depth and line width.

Team members: *Currently 38 members from 18 institutions in 7 countries*
Elaine Sadler (Sydney, PI), James Allison (Sydney), Chris Blake (Swinburne), Joss Bland-Hawthorn (Sydney), Robert Braun (ATNF), Matthew Colless (AAO), Rob Crain (Swinburne), Scott Croom (Sydney), Darren Croton (Swinburne), Stephen Curran (UNSW), Jeremy Darling (USA), John Dickey (Tasmania), Michael Drinkwater (Qld), Ron Ekers (ATNF), Sara Ellison (Canada), Bjorn Emonts (ATNF), Ilana Feain (ATNF), Ken Freeman (ANU), Bryan Gaensler (Sydney), Dick Hunstead (Sydney), Helen Johnston (Sydney), Baerbel Koribalski (ATNF), Philip Lah (ANU), Tom Mauch (Oxford), Martin Meyer (UWA), Raffaella Morganti (Netherlands), Tom Oosterloo (Netherlands), Max Pettini (UK), Kevin Pimbblet (Monash), Michael Pracy (Swinburne), Steve Rawlings (Oxford), Sarah Reeves (Sydney), Tim Robishaw (Sydney), D.J. Saikia (Pune, India), Lister Staveley-Smith (UWA), Matthew Whiting (ATNF), Richard Wilman (Melbourne), Martin Zwaan (ESO)

Cosmic HI mass density



Neutral hydrogen is the *missing link* in our current models of galaxy evolution

- We know almost nothing about the HI content of galaxies at redshift z>0.2.
- A wide range of models and simulations exist, none of which fit all the data.
- Need better observations!

The advantages of ASKAP

ASKAP's

- Wide (30 deg^2) field of view
- Large spectral bandwidth
- Radio-quiet site

make it possible to carry out the first *blind* radio survey for HI absorption

Only about 400 sightlines have so far been searched for HI absorption in the radio - roughly 200 each with single-dish (blind) and interferometer (targeted) programs.

In the ASKAP-FLASH survey, we will target over 150,000 sightlines to bright background continuum sources, *an increase of more than two orders of magnitude over previous work.*

FLASH key points

For an HI absorption-line survey (unlike emission-line surveys), sensitivity is independent of redshift!

- Blind HI absorption-line survey at $0.5 < z < 1.0$ with ASKAP
- FLASH will cover whole southern sky (dec < 0 deg)
- 2 hr integration per field at 700-1000 MHz
- Probe ~150,000 sightlines to background radio sources, expect to detect ~ 450 intervening absorption-line systems (and ~600 associated absorbers) at $0.5<z<1.0$
- Result: the first *HI-selected galaxy sample* at $z > 0.5$
- Piggyback with WALLABY emission-line survey at $0<z<0.26$

http://www.physics.usyd.edu.au/sifa/FLASH

FLASH survey parameters

	FLASH	WALLABY piggyback
Survey area (deg²)	25,000	30,000
Observing freq. (MHz)	700-1000	1130-1430
HI redshift range	0.5 <z< 1.0	0 <z< 0.26
Angular resol. (arcsec)	30	30
Spectral resol. (kHz)	18	18
Bandwidth (MHz)	300	300
Integration time per field (hr)	2	8
Total obs. time (hr)	1600	*(9600)*
Expected detections (intervening)	~450	~400

Cross-comparison of emission, absorption and stacking measurements at z<0.26 is a new and important aspect of the ASKAP HI surveys