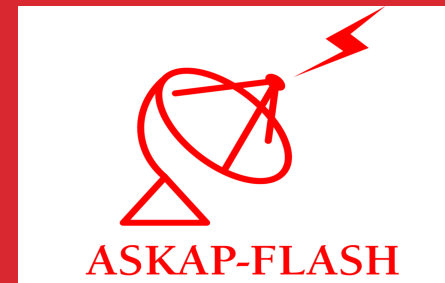


# Analysis of HI Absorption in simulated ASKAP-FLASH Data

*James Allison*  
*University of Sydney*

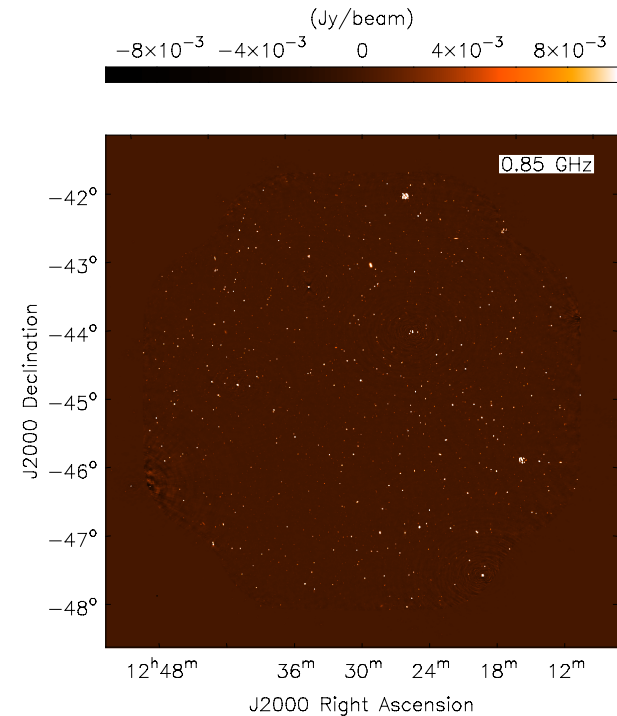
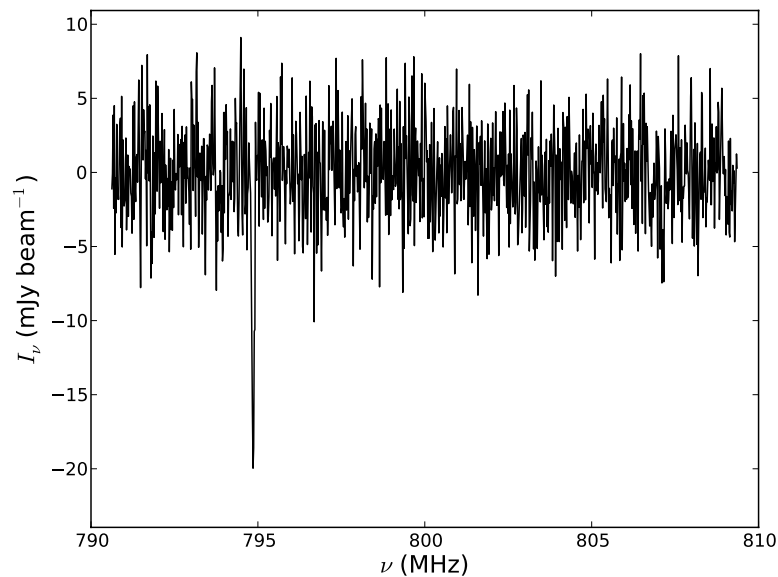
On behalf of Elaine Sadler, Matt Whiting and the ASKAP-FLASH team



THE UNIVERSITY OF  
SYDNEY

## Simulated ASKAP Data Cube

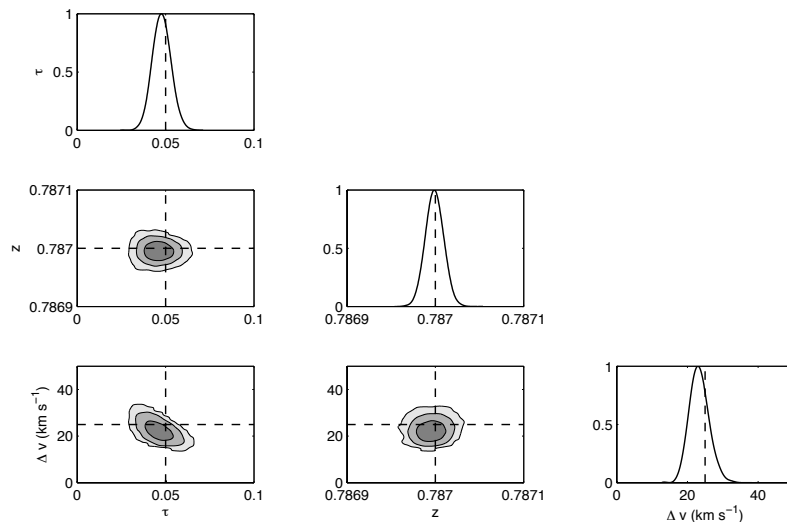
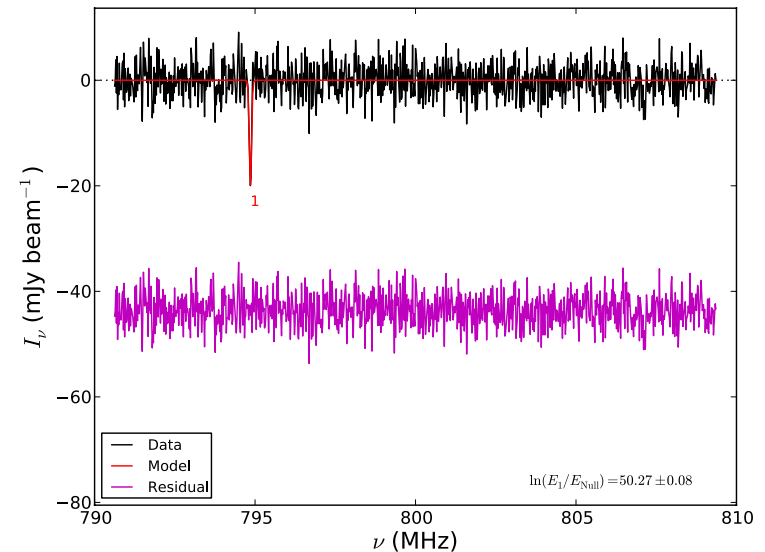
- 30 deg<sup>2</sup> field-of-view
- 2 hour integration
- 18 MHz bandwidth (vs full ASKAP 300 MHz)
- 1024 channels (vs full ASKAP 16 000)
- Continuum source catalogue from simulations by Wilman et al.(2008)



## Gaussian HI 21 cm absorption components

- 600 intervening absorption lines painted onto 435 brightest continuum sources ( $S_{800} > 10$  mJy)
- Peak optical depths  $0.01 < \tau < 0.30$
- Redshifts  $0.760 < z < 0.792$  (793 – 807 MHz)
- Velocity widths  $5 < \Delta v < 80$  km s<sup>-1</sup>
- Spectra extracted at known source positions

- 1-dimensional line finding using Bayesian method
- Based on multi-nested sampling algorithm developed by Skilling (2004) and Feroz & Hobson (2008)
  - Detection significance determined from ratio of evidence statistic for model with line vs no line
  - Provides a quantitative measure of parameter probability and model suitability

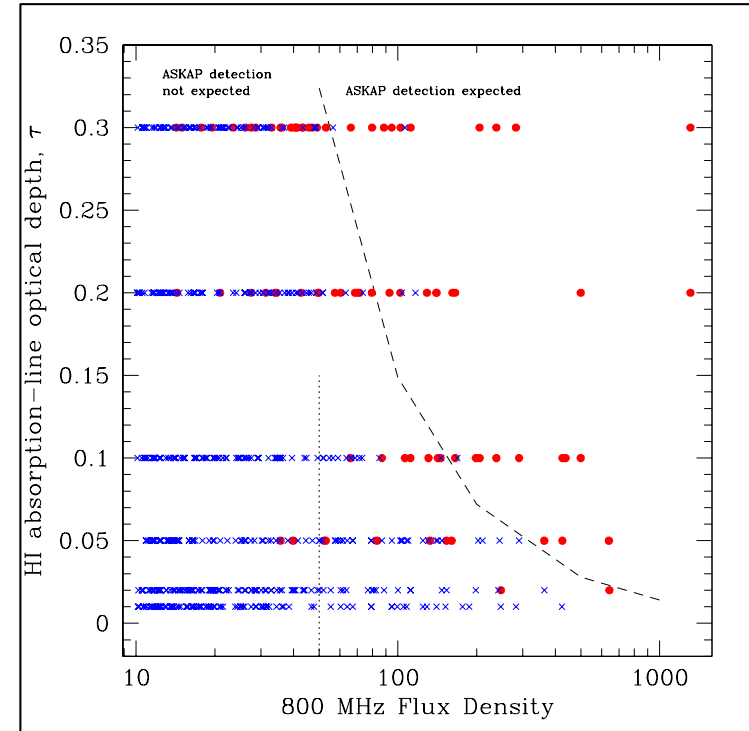
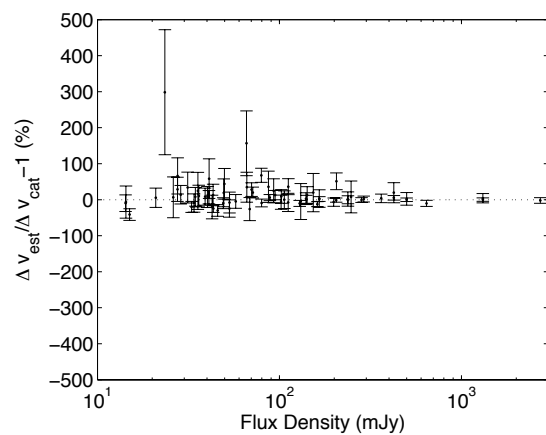
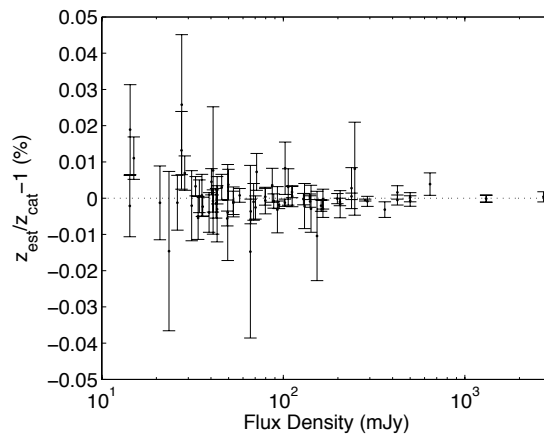
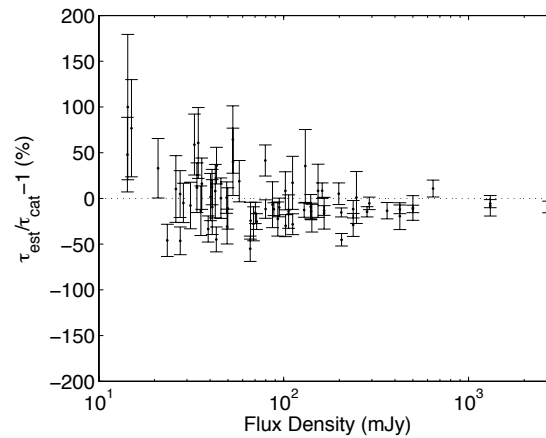


## Example Detection

- Simulated ASKAP source of flux density  $S_{800} = 198.7$  mJy
- Two input absorption line components present
- One component is detected with significance using a single Gaussian model
- Returned probability distributions for model parameters are consistent with input absorption-line catalogue values

# Summary of detections in simulation

- Returned parameter values are consistent with input source catalogue
- It is expected that FLASH will observe 150 000 continuum sources and return properties for over 1000 HI absorption systems



Expected ASKAP detections from 2hr pointing based on peak optical depth

- Red circle = Detection
- Blue cross = Non-detection
- Dashed line = Expected detection

Allison et al. (in prep.)

Allison J. R., Sadler E. M., Whiting M. T., 2011, in prep.

Feroz F., Hobson M. P., 2008, MNRAS, 384, 449

Skilling J., 2004, 24th International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering Vol. 735, pp 395–405

Wilman R. J., Miller L., Jarvis M. J., Mauch T., Levrier F., Abdalla F. B., Rawlings S., Klockner H., Obreschkow D., Olteanu D., Young S., 2008, MNRAS, 388, 1335

---