

The Host Galaxy of a Fast Radio Burst FRB150418

KEANE, E. F.^{1/2/3}, JOHNSTON, S.⁴, BHANDARI, S.^{2/3}, BARR, E.², BHAT, N. D. R.^{3/5}, BURGAY, M.⁶
CALEB, M.^{2/3/7}, FLYNN, C.^{2/3}, JAMESON, A.^{2/3}, KRAMER, M.^{8/9}, PETROFF, E.^{2/3/4}, POSSENTI, A.⁶
VAN STRATEN, W.², BAILES, M.^{2/3}, BURKE-SPOLAOR, S.¹⁰, EATOUGH, R. P.⁸, STAPPERS, B. W.⁹
TOTANI, T.¹¹, HONMA, M.^{12/13}, FURUSAWA, H.¹², HATTORI, T.¹⁴, MOROKUMA, T.¹¹, NIINO, Y.¹²
SUGAI, H.¹¹, TERAJ, T.¹⁴, TOMINAGA, N.^{11/15}, YAMASAKI, S.¹¹, YASUDA, N.¹¹, ALLEN, R.², COOKE, J.^{2/3}
JENCSON, J.¹⁶, KASLIWAL, M. M.¹⁶, KAPLAN, D. L.¹⁷, TINGAY, S. J.^{3/5}, WILLIAMS, A.⁵, WAYTH, R.^{3/5}
CHANDRA, P.¹⁸, PERRODIN, D.⁶, BEREZINA, M.⁸, MICKALIGER, M.⁹, BASSA, C.¹⁹

1: SKA Organisation, 2: Swinburne University of Technology, 3: CAASTRO, 4: CSIRO, 5: Curtin University, 6: INAF, 7: Australian National University, 8: MPIfR, 9: University of Manchester, 10: NRAO, 11: University of Tokyo, 12: NAOJ, 13: SOKENDAI, 14: Subaru Telescope, 15: Konan University, 16: California Institute of Technology, 17: University of Wisconsin-Milwaukee, 18: Tata Institute of Fundamental Research, 19: ASTRON

Fast Radio Burst (FRB) is a short radio burst lasting only 1 msec observed at GHz band. The nature of FRB is still mystery and various models are proposed ranging from a radio interference from the Earth to a burst of an astronomical object at a cosmological distance. FRBs show a large dispersion along the frequency, and its plausible interpretation is that the radio burst originates from a cosmological explosive event, and it is observed after long-distance travel through the inter-galactic plasma. However, there has been no detection of the host galaxy of any FRB or its redshift measurement.

FRB150418, detected on 18 April 2015, was first discovered with the Parkes telescope multi-beam receivers, and follow-up observations with ATCA detected a compact, variable radio source in one of the Parkes beams. The source has rapidly faded within 1 week after the burst, and showed larger flux variation in lower frequency, indicating that the source has a different nature from radio AGN and is most likely a radio afterglow of the FRB. The optical follow-up with the Subaru telescope detected an elliptical galaxy at the position of the radio afterglow, and the redshift measurement with Subaru revealed that the host has a redshift of 0.492. This is the first detection of the FRB host galaxy and its redshift. The host galaxy is an elliptical galaxy with little sign of star formation, which provides a strong constraint on the possible origin of the FRB. Meanwhile, the redshift is consistent with the expectation from the standard cosmology with missing baryons in the form of inter-galactic plasma, confirming that a large fraction of missing-baryon is in the inter-galactic medium.

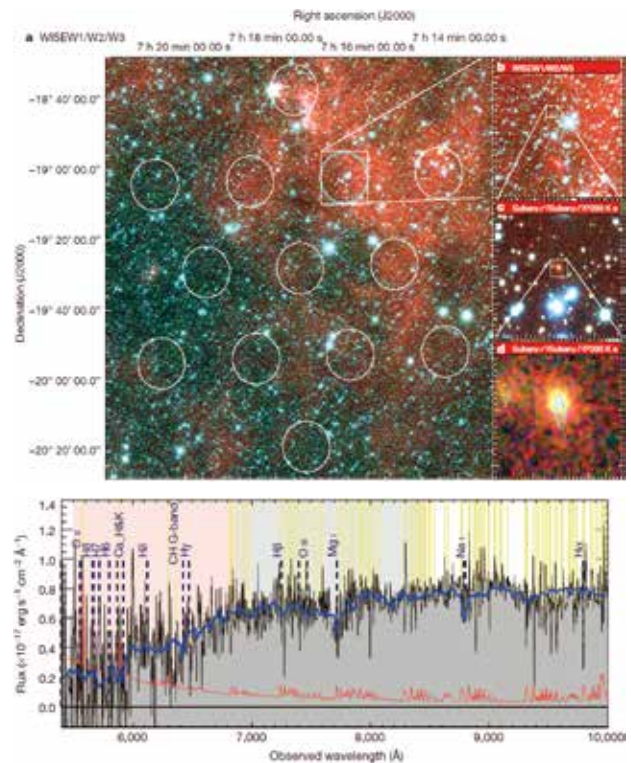


Figure 1: Upper-images: An optical image of the Parkes multi-beam fields (circles), with the zoom-up images on the right showing the FRB-host elliptical galaxy discovered with Subaru. Bottom-panel: The spectrum of the elliptical galaxy taken with Subaru, which matches well with the template of an elliptical galaxy at a redshift of 0.492.

Reference

[1] Keane, E., et al.: 2016, *Nature*, **539**, 453.