FastSound: The Subaru FMOS Galaxy Redshift Survey

TONEGAWA, Motonari[1], TOTANI, Tomonori[1], OKADA, Hiroyuki[1], AKIYAMA, Masayuki[2], DALTON, Gavin[3]
GLAZEBROOK, Karl[4], IWAMURO, Fumihide[5], MAIHARA, Toshinori[5], OHTA, Koji[5], SHIMIZU, Ikkoh[1]
TAKATO, Naruhisa[6], TAMURA, Naoyuki[7], YABE, Kiyoto[6], BUNKER, Andrew J.[3/7], COUPON, Jean[8]
FERREIRA, Pedro G.[3], FRENK, Carlos S.[9], GOTO, Tomotsugu[10], HIKAGE, Chiaki[11], ISHIKAWA, Takashi[5]
MATSUBARA, Takahiko[11], MORE, Surhud[7], OKUMURA, Teppei[7], PERCIVAL, Will J.[12]
SPITLER, Lee R.[13/14], SZAPUDI, Istvan[15]

1: University of Tokyo, 2: Tohoku University, 3: University of Oxford,4: Swinburne University of Technology, 5: Kyoto University, 6: NAOJ, 7: Kavli IPMU, 8: University of Geneva, 9: University of Durham, 10: National Tsing Hua University, 11: Nagoya University, 12: Portsmouth University, 13: Australian Astronomical Observatory, 14: Macquarie University, 15: University of Hawaii

Recent precision cosmological observations have revealed that our Universe is in the phase of an accelerated expansion currently. However, this unexpected acceleration is still a mystery, with possible two descriptions: an exotic form of energy with negative pressure (dark energy) and breakdown of general relativity on cosmological scales (modified gravity). FastSound project is a redshift survey with FMOS on Subaru telescope, probing a distant Universe beyond redshift one for the first time. The primary goal is to detect an anisotropy in the 3-D distribution of galaxies brought by redshift space distortion (RSD), measure the growth rate of the large-scale structure $f\sigma_8$, and test gravity theories by comparing $f\sigma_8$ with theoretical predictions.

The observation was carried out over 35 nights from April 2012 to July 2014, taking spectra of ~47,000 galaxies over 20 deg^2. Target selection was based on optical 5 bands ($u^*g'r'i'z'$) of CFHTLS Wide 1–4. The image data was processed using the standard reduction pipeline of FMOS [1], followed by automated emission line detection by a dedicated software algorithm [3], resulting in ~4,000 emission line detections. Table 1 shows the number of emission lines and estimated contamination rate for several *S/N* thresholds, and Figure 1 is the galaxy distribution on the celestial sphere.

Table 1: Number of emission lines and estimated contamination rate for several *S/N* thresholds.

	Line Number	Contamination
$S/N \geq 5.0$	3,080	2.3 %
$S/N \geq 4.5$	3,769	4.5 %
$S/N \geq 4.0$	4,797	9.2 %
$S/N \geq 3.5$	6,805	22.2 %

RSD was detected with 4σ confidence level from a clustering analysis with this data [2], giving the linear growth rate of the large-scale structure ($f\sigma_8 = 0.482^{+0.116}_{-0.116}$ at $z = 1.4$), which is consistent with the prediction of ΛCDM model. Fundamental metallicity relation of FastSound galaxies was also examined using detected Hα and [NII] lines [5].

Redshift catalog has been created from these data [4] and become public (http://www.kusastro.kyoto-u.ac.jp/Fastsound/index.html) and accessible to anyone.

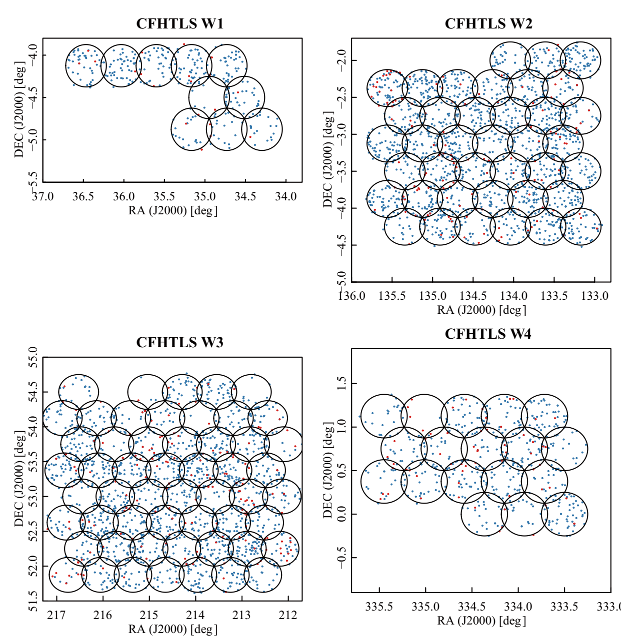

Figure 1: The 2-D distribution of FastSound galaxies. Blue dots are galaxies whose emission lines are detected in normal spectrum, while red dots are those for which the line detection algorithm find signals in inverted (−1 multiplied) spectrum. The latter gives an estimation of false detection rate.

References

[1] Iwamuro, F., et al.: 2012, *PASJ*, **64**, 59.
[2] Okumura, T., et al.: 2016, *PASJ*, **68**, 38.
[3] Tonegawa, M., et al.: 2015, *PASJ*, **67**, 31.
[4] Tonegawa, M., et al.: 2015, *PASJ*, **67**, 81.
[5] Yabe, K., et al.: 2015, *PASJ*, **67**, 102.