Young Dusty Starburst Galaxies at z～2

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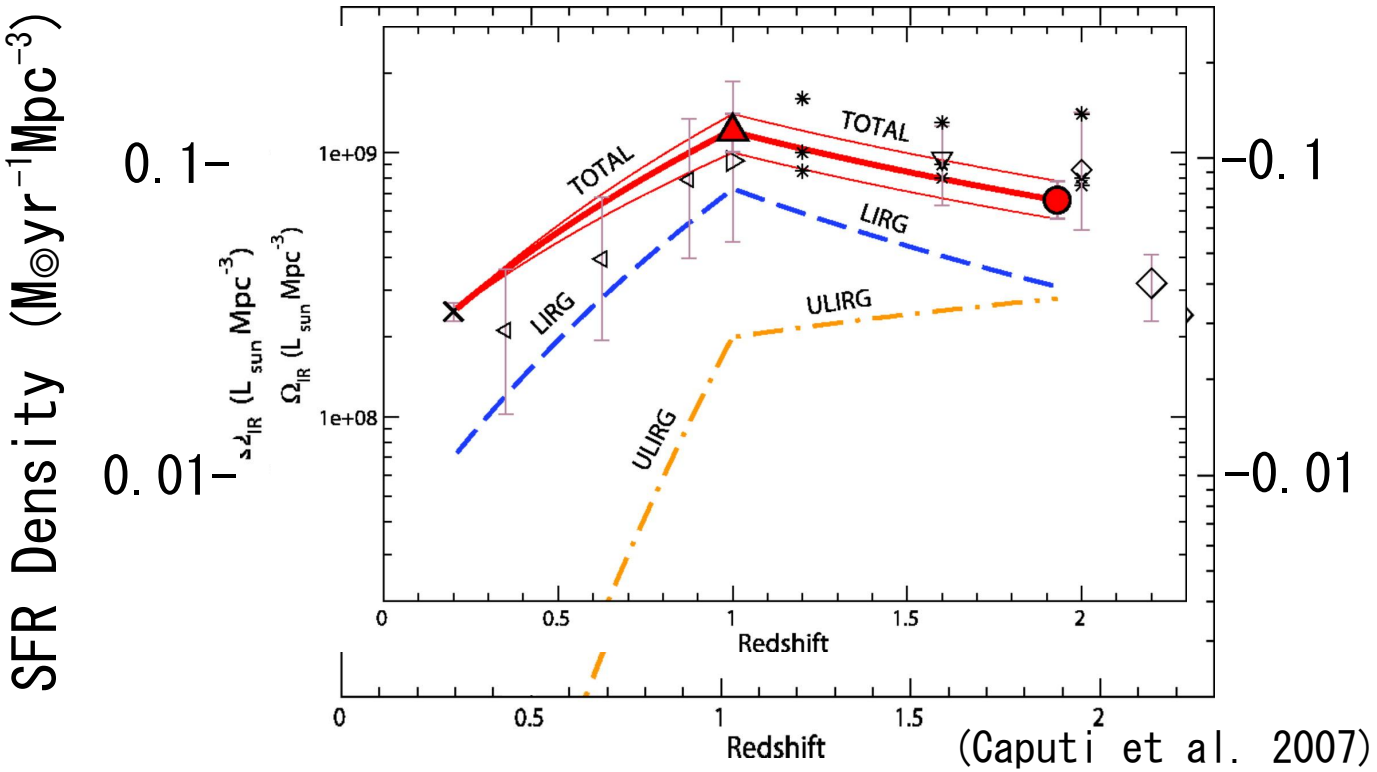
Cosmic SFR Density

Cosmic History of SFR Density

cosmic SFR density has its peak at z～2 and monotonically decays from z～1 to the present universe.



What populations do contribute to the star formation at the star-forming epoch of the Universe?

Spectroscopic Observation of Galaxies at z～2

Observation of Hα Emission Lines

Star Formation Rate Indicator

Spectroscopic Redshift

difficult for optical instruments

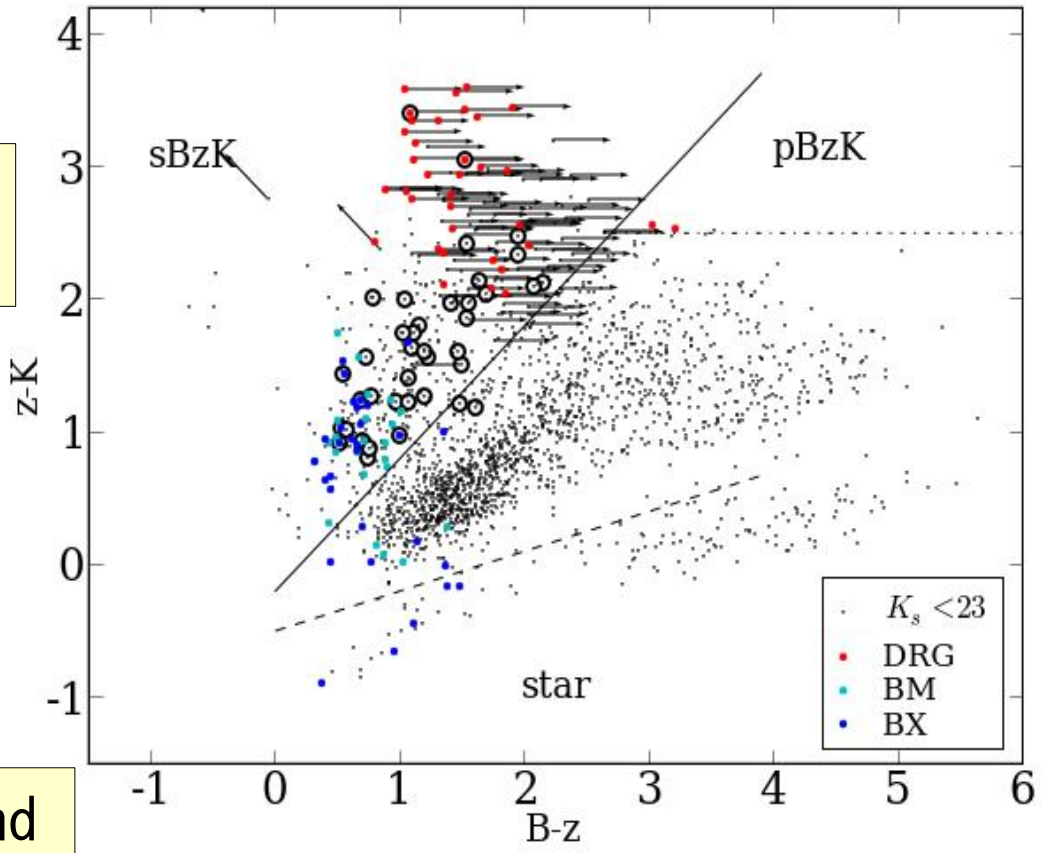
Sample Selection

Star-Forming BzK

designed to select z=1.4-2.5

MIPS+sBzK

S_{24}>80μJy: ULIRGs at z～2



Present Samples (○) on BzK diagram

previous studies (e.g., BX/BM and DRGs) are biased by attenuation/age

Near-infrared spectrograph is suitable to study star-forming galaxies at z~2 → Subaru/MOIRCS !

Data

Star-Forming BzK galaxies

K-selected star-forming galaxy at z~2 (MOIRCS Deep Survey field) with Ks < 23 (AB)

S_{24} > 80μJy: 18

S_{24} < 80μJy: 21

39 galaxies in total

X-ray galaxies (Alexander et al. 2003) are excluded.

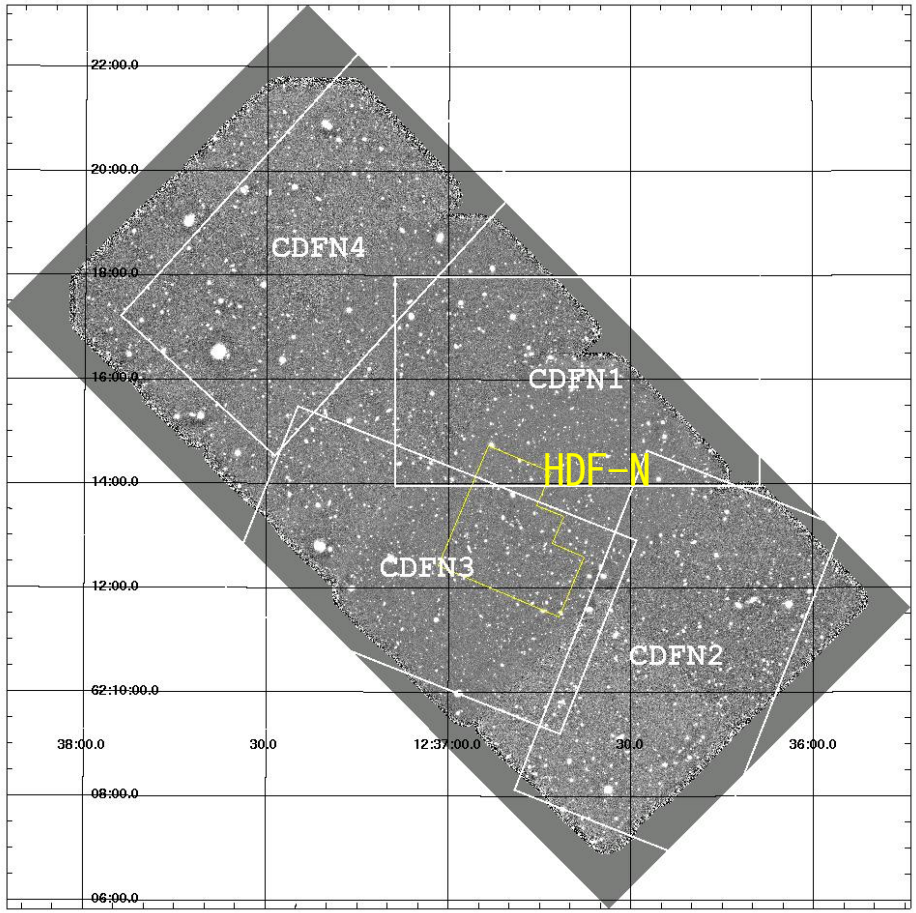
Observation

Subaru/MOIRCS MOS mode

4 masks (CDFN1-4)

exposure time: 160-320 min

HK500 grism + 0.8" slit: R~500

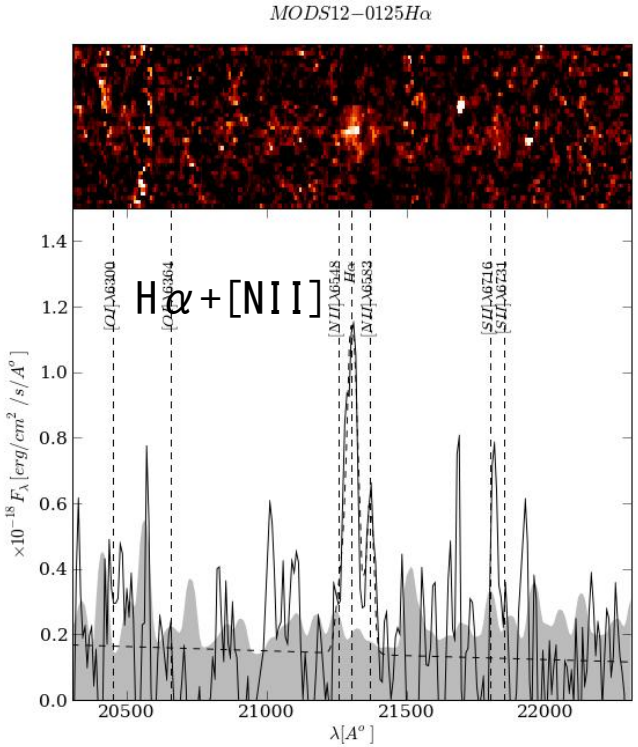


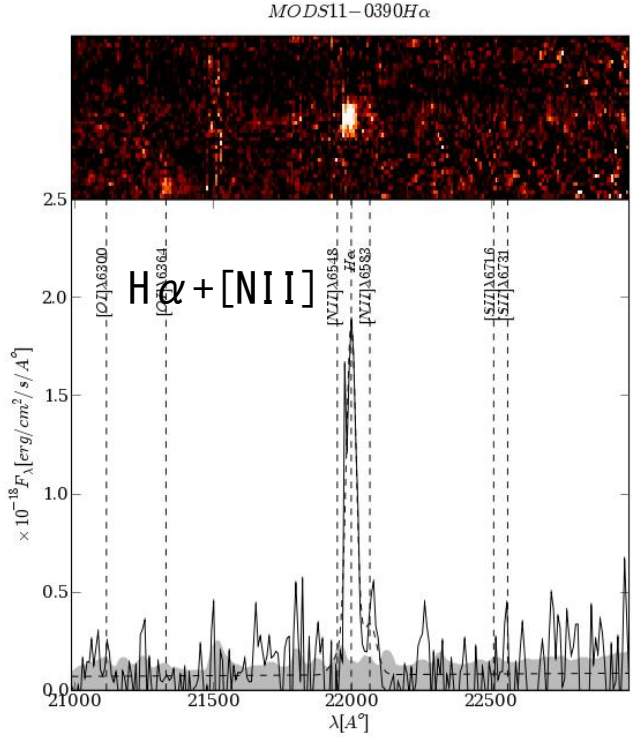
※ serendipitous target of Akiyama et al.

Hα Emission Lines

Hα Detection Rate

	obs.	Hα	rate
S_{24}>80μJy	26	15	58%
S_{24}<80μJy	13	8	62%
total	39	23	59%





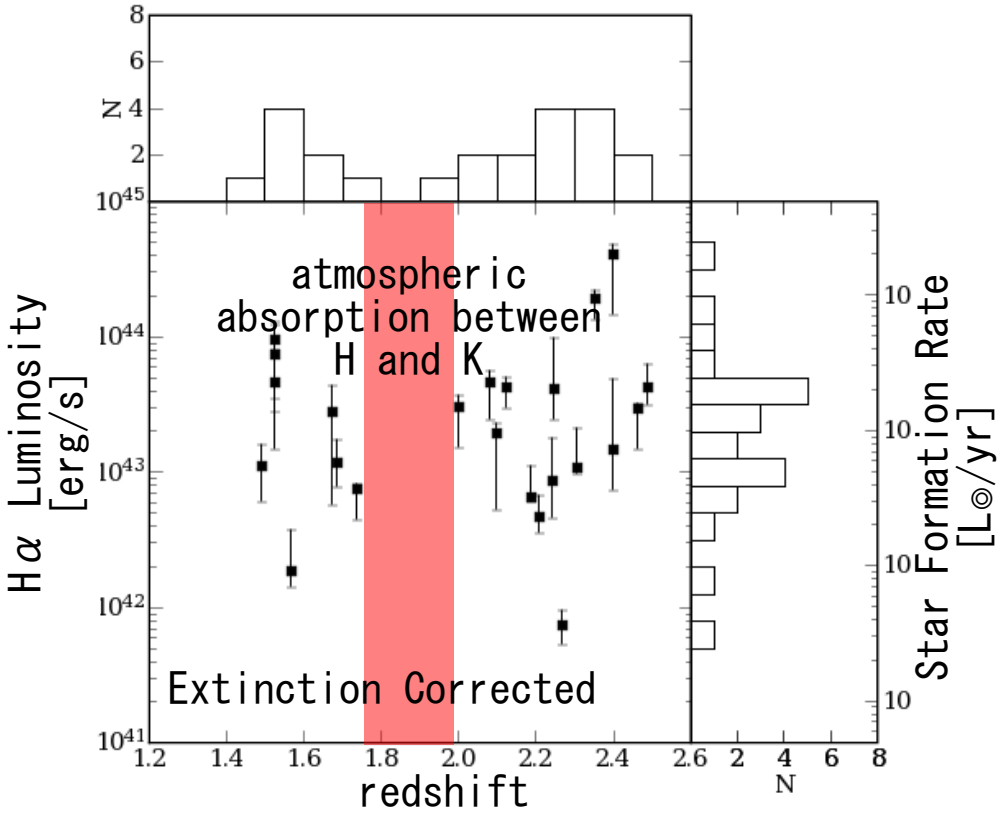
Hα Emission Lines

Redshift Distribution

sBzK galaxies lie at 1.4<z<2.5

The galaxies without emission line detection have smaller SFR?

expected detection rate is much higher (>85%), if all samples have similar SFR.



SFR and Stellar Mass

Our Emission Line Galaxies

only a weak correlation between SFR and M★

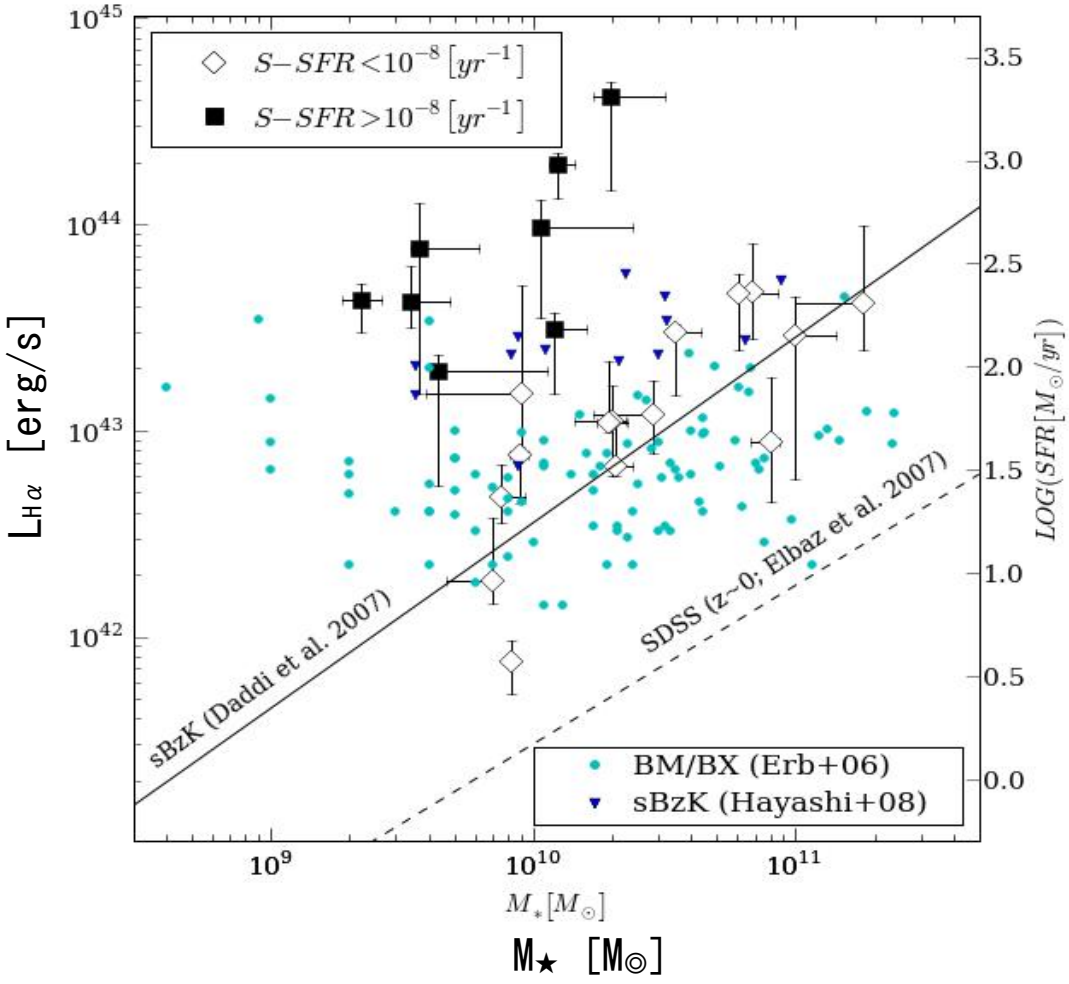
A part of low mass galaxies have higher SFR

Other Studies

Daddi+ 2007 (sBzK, rest-UV)

strong correlation

other studies using Hα emission line also show week (shallower) correlation



divide the samples into two groups with SSFR (■◇)

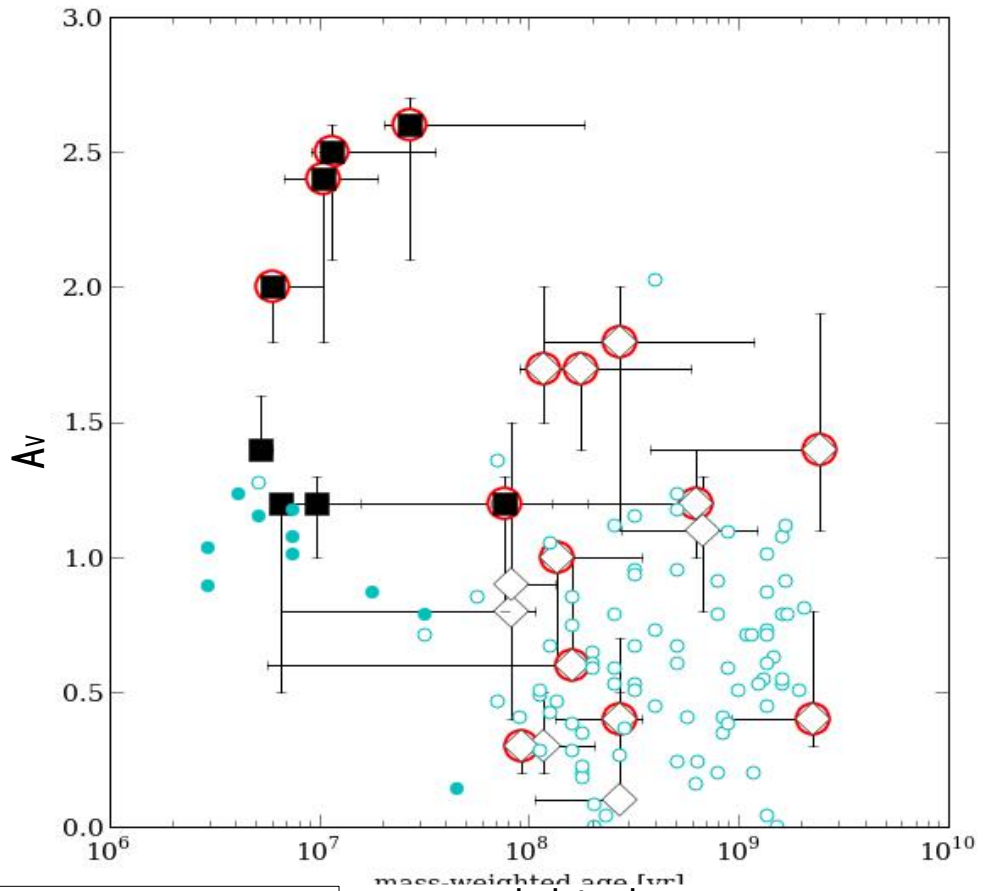
Young Dusty Starburst Galaxies

Mass-Weighted Age and Extinction

Large SSFR galaxies are young and dusty galaxies

A part of BM/BX galaxies (Erb et al. 2006) are also young but less attenuated.

mid-infrared selected samples choose the young and dusty galaxies?



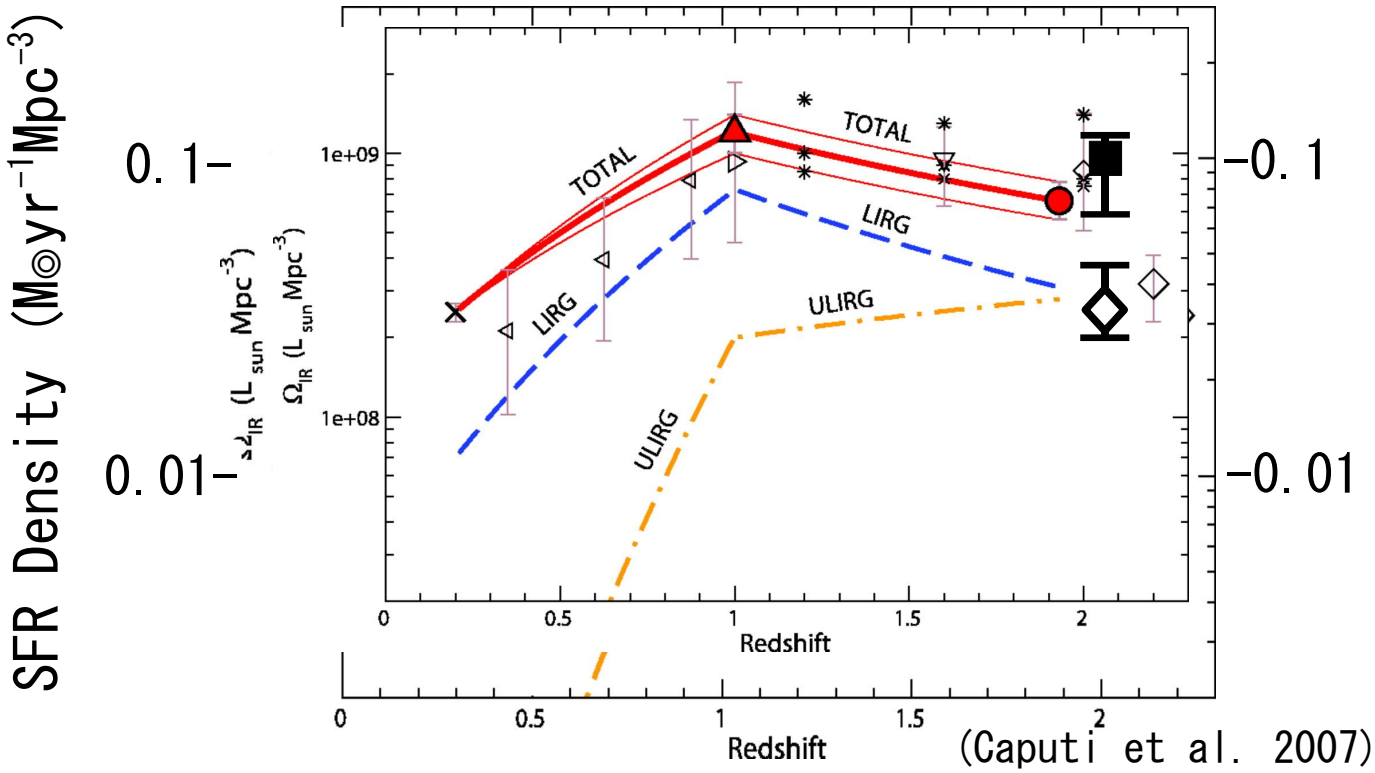
■◇: this work
●○: BM/BX (Erb et al. 2006)
filled symbol: SSFR > 10^{-8} yr^{-1}
○: S_{24}>80 μ Jy

Contribution to Cosmic SFR Density

SFR Density Estimated from Hα Luminosity

■ SSFR > $10^{-8}yr^{-1}$: 0.105 $^{+0.020}_{-0.039} M_{\odot} yr^{-1} Mpc^{-3}$

◇ SSFR < $10^{-8}yr^{-1}$: 0.032 $^{+0.015}_{-0.006} M_{\odot} yr^{-1} Mpc^{-3}$



(Caputi et al. 2007)

Low-mass young dusty galaxies significantly contribute to the cosmic SFR density

Summary

We observed 39 sBzK galaxies and Hα emission lines are detected from 23 of them.

Our emission line galaxies show only a weak correlation between stellar mass and star formation rate, owing to **large specific SFR galaxies**.

Large specific SFR galaxies are **young and dusty starburst galaxies** with bright 24μm flux.

Low-mass young dusty galaxies would significantly contribute to the cosmic SFR density at z～2