

CHORUS :

Data reduction of Subaru/HSC NB527 filter
for investigating Lyman continuum leakage

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Outline

- Introduction
- Summary of data
- Image Quality Check
- Catalog Quality Check
- Future prospects

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Summary

The "BETA" images and catalog of HSC/NB527 will be released. If you are interested in the data, please let us know !

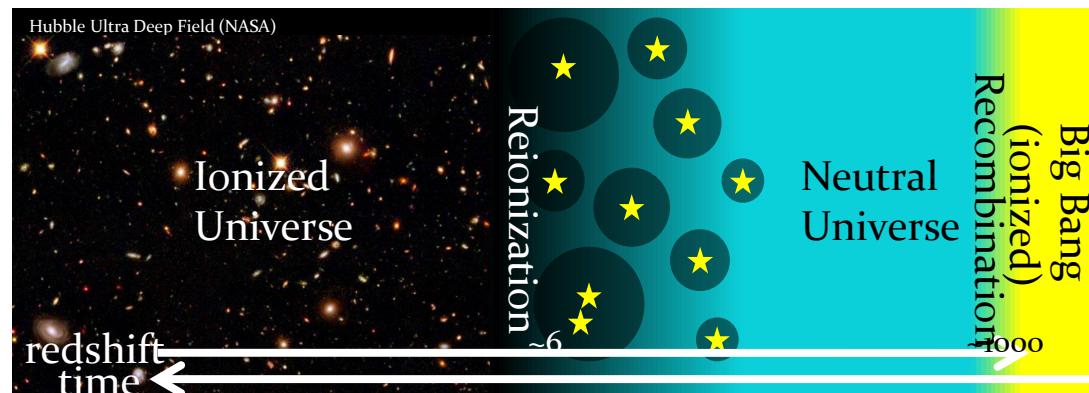
Introduction

CHORUS

Cosmic HydrOgen Reionization Unveiled with Subaru

REVEALING REIONIZATION

- History
 - Sources
 - Topology
- 
- SSP LAE LF/ACF measurements
 - LyC measurements of galaxies and AGNs
 - Faint-AGN LF measurements
 - Pop-III SFRD measurements
 - Visualization of spatial distribution of xHI



Introduction

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Cosmic HydrOgen Reionization Unveiled with Subaru

STRATEGY

HSC-SSP UD

5 Broadband filters

(g, r, i, z, Y)

1 Narrowband NB921

There are two more NBs in SSP: NB816, NB101

5 Narrowband filters

NB387, NB527, NB718,
IB945, NB973

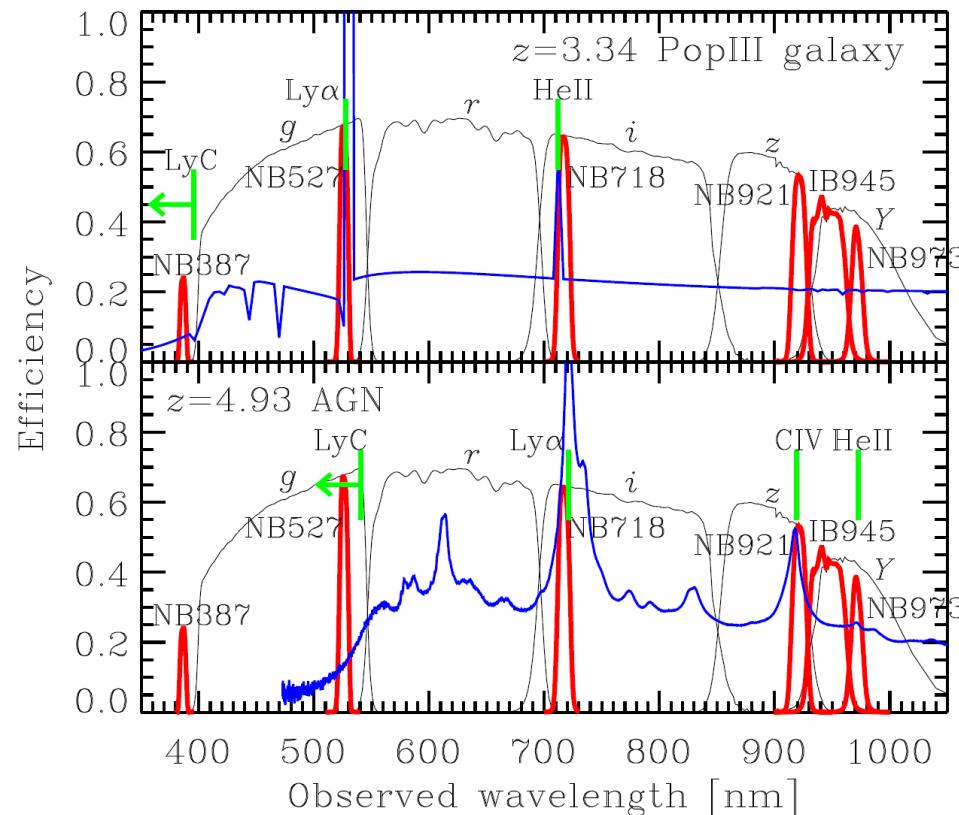
→ CHORUS

Introduction

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Cosmic HydrOgen Reionization Unveiled with Subaru

CHORUS FILTER SET



Summary of Data

Data :

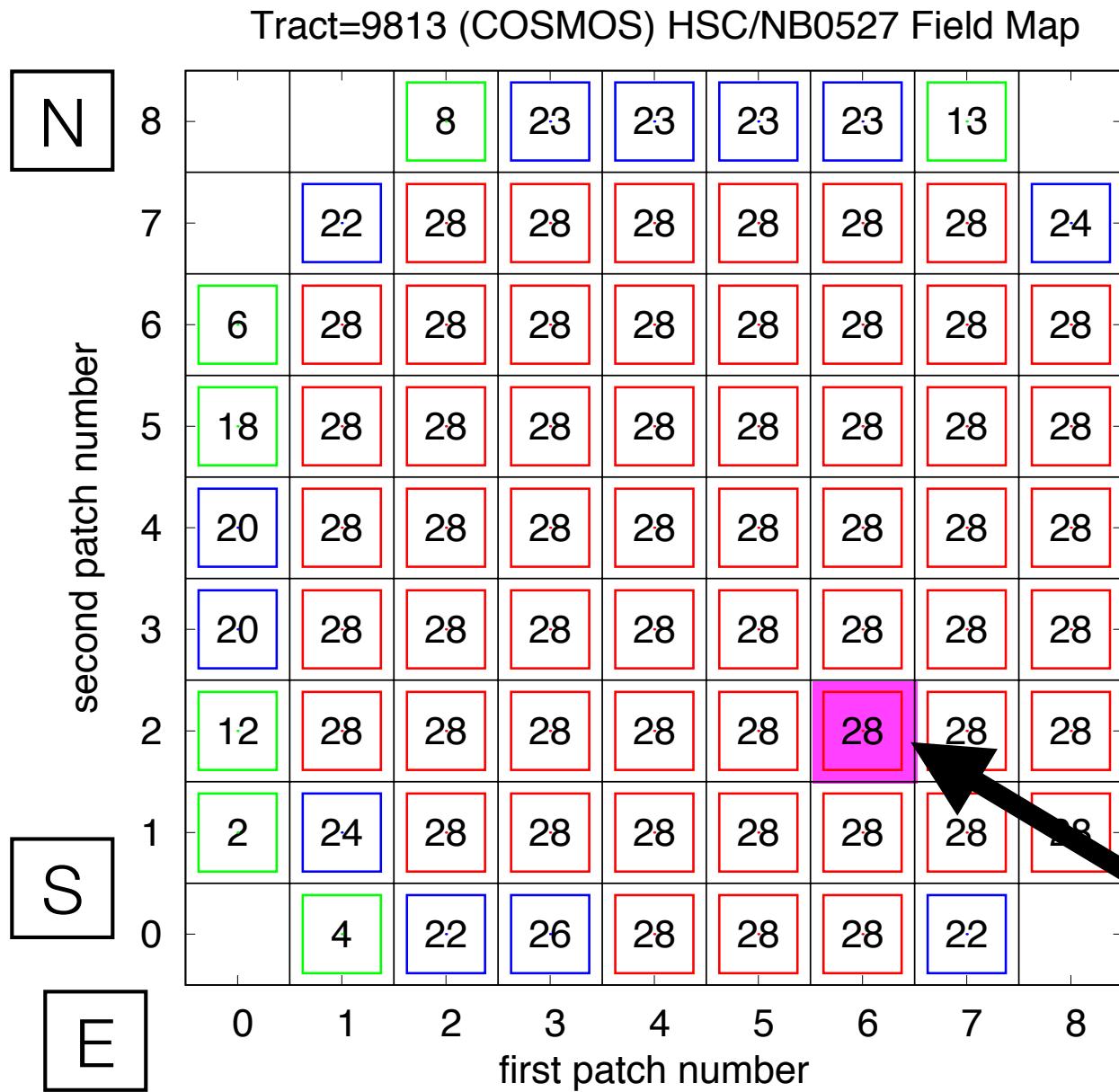
- Subaru/HSC NB0527
- Target Field : COSMOS
- Date of observation : 2017/12/18, 2018/03/16, 2018/03/19
- Total number of visit (shot) : 36 visit

Analysis :

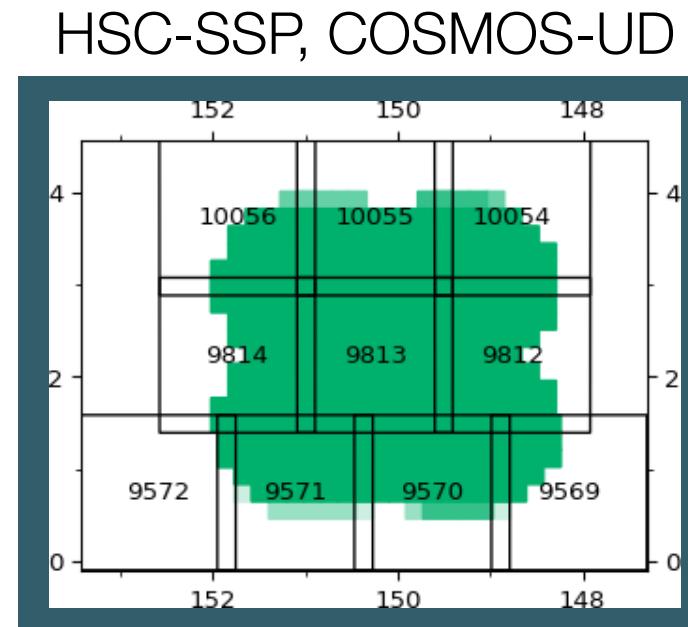
- Pipeline version : hscPipe v4.0.5 (Latest version : v6.6 ?)
- SSP data version : S16a
- Priority in multiband.py : following list

'NB0527', 'HSC-I2', 'HSC-I', 'HSC-R2', 'HSC-R', 'HSC-Z', 'HSC-Y', 'HSC-G',
'NB0921', 'NB0816', 'NB1010', 'NB0387', 'NB0515', 'NB0973', 'NB0718

Summary of Data

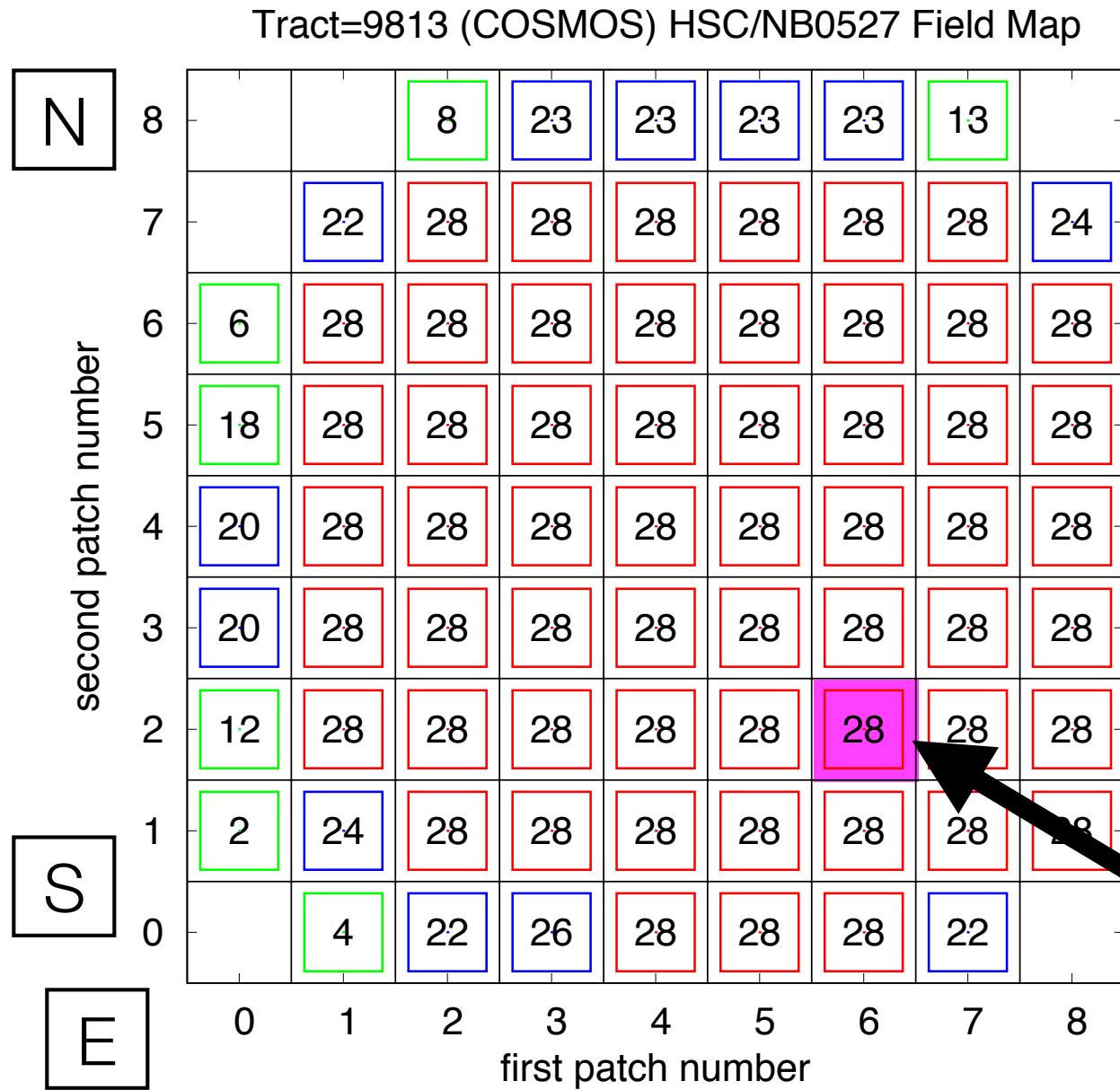


Filed Map
number of reliable visit



patch = (6, 2)

Summary of Data



Filed Map
number of reliable visit

1patch
 $= 4200 \times 4200 (\text{pixel}^2)$
 $= 11.76 \times 11.76 (\text{arcmin}^2)$

patch = (6, 2)

Summary of Data

Tract=9813 (COSMOS) HSC/NB0527 Field Map

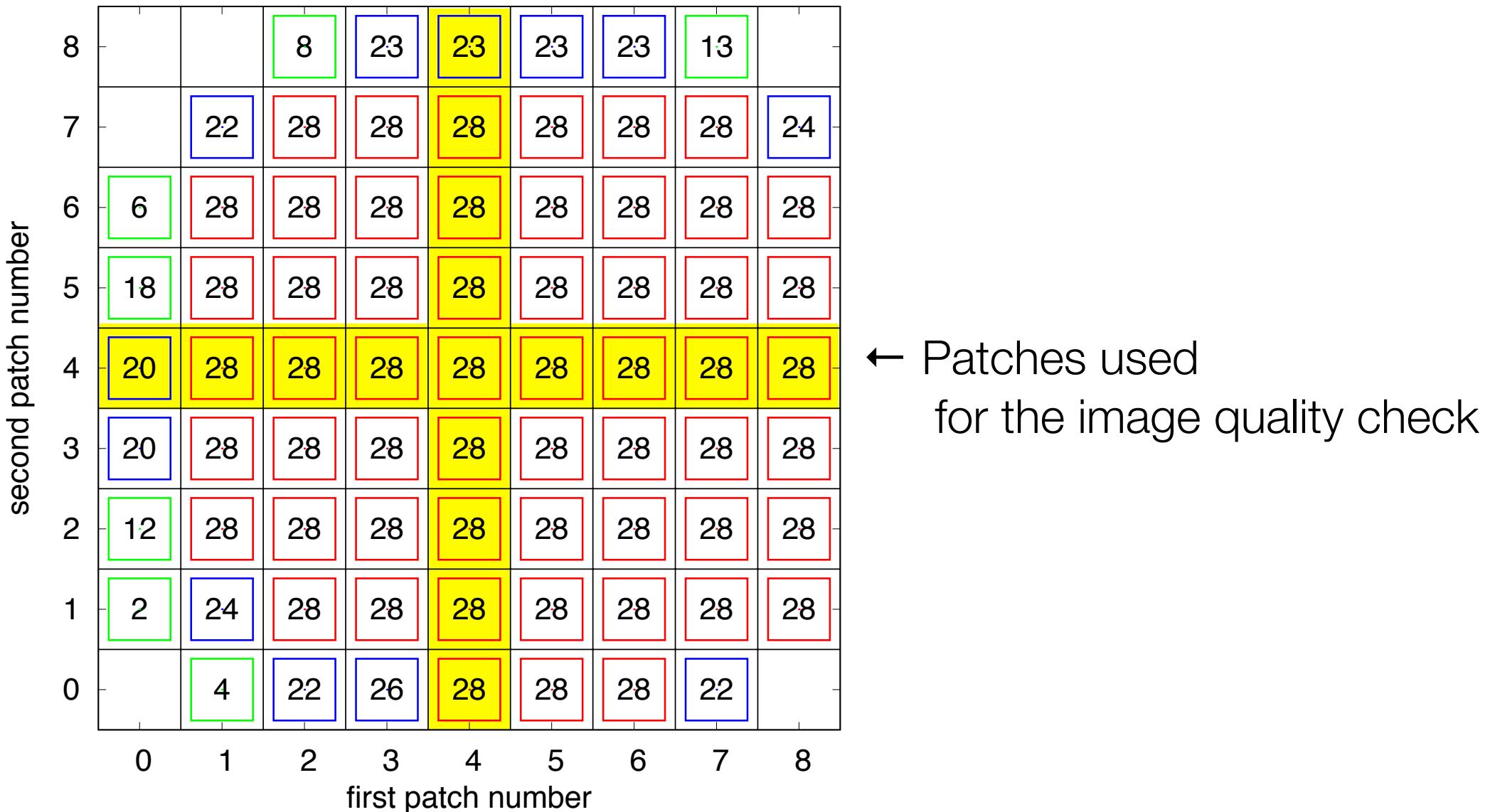


Image Quality Check -Prepared stack image-

Reliable Stack

In the stacking procedure, we use the visit which satisfies the following criteria.

- Exposure Time > 30 s
- Seeing < 1.2 arcsec
- Transmittance > 0.75

The total exposure time is 32361.3 s (~9.0 h).

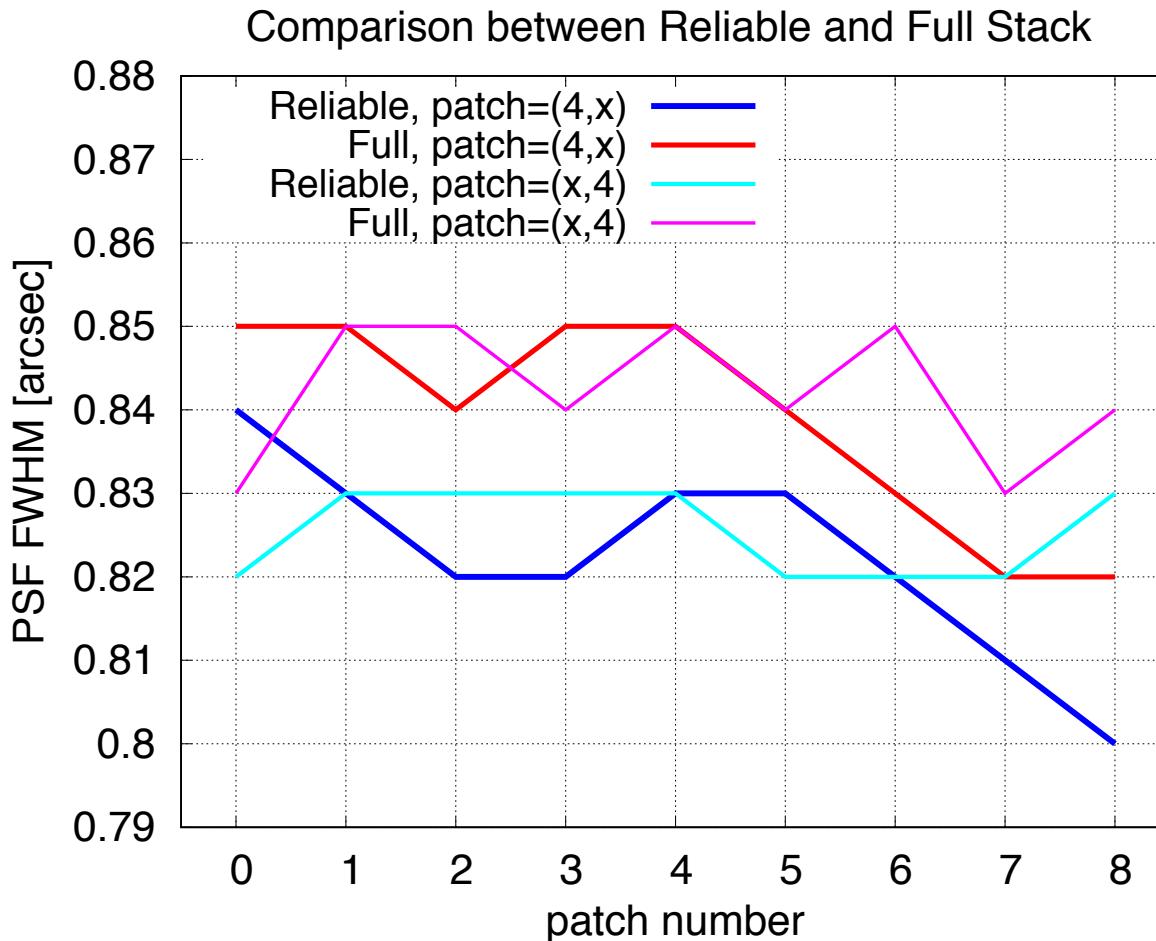
Full Stack

We use all the visit in the stacking procedure.

The total exposure time is 37281.3 s (~10.4 h).

This stack is used for the image quality check.

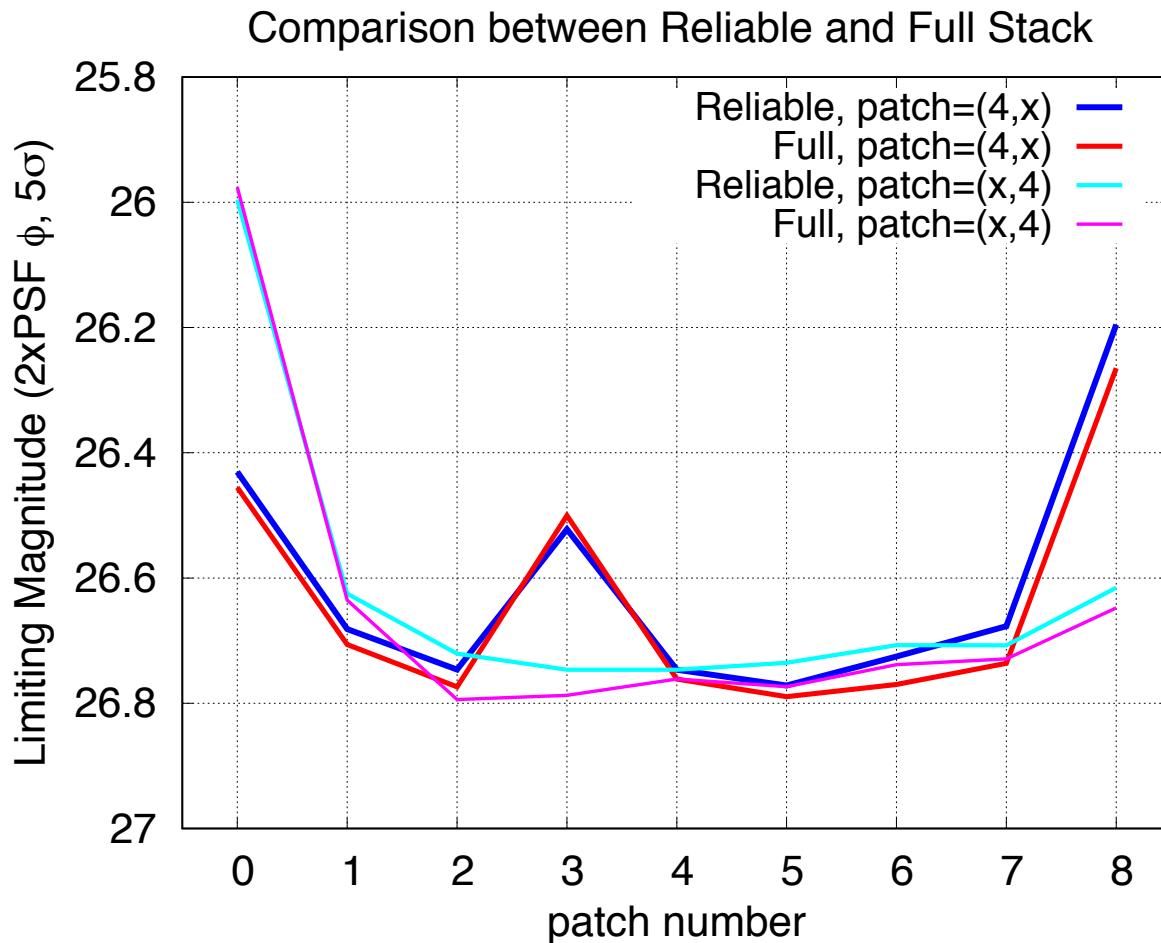
Image Quality Check -PSF FWHM-



- PSF FWHM of **Reliable Stack** is ~0.82 arcsec
- PSF FWHM of **Full Stack** is ~0.84 arcsec

The PSF FWHM of **Reliable Stack** is better than that of **Full Stack**.

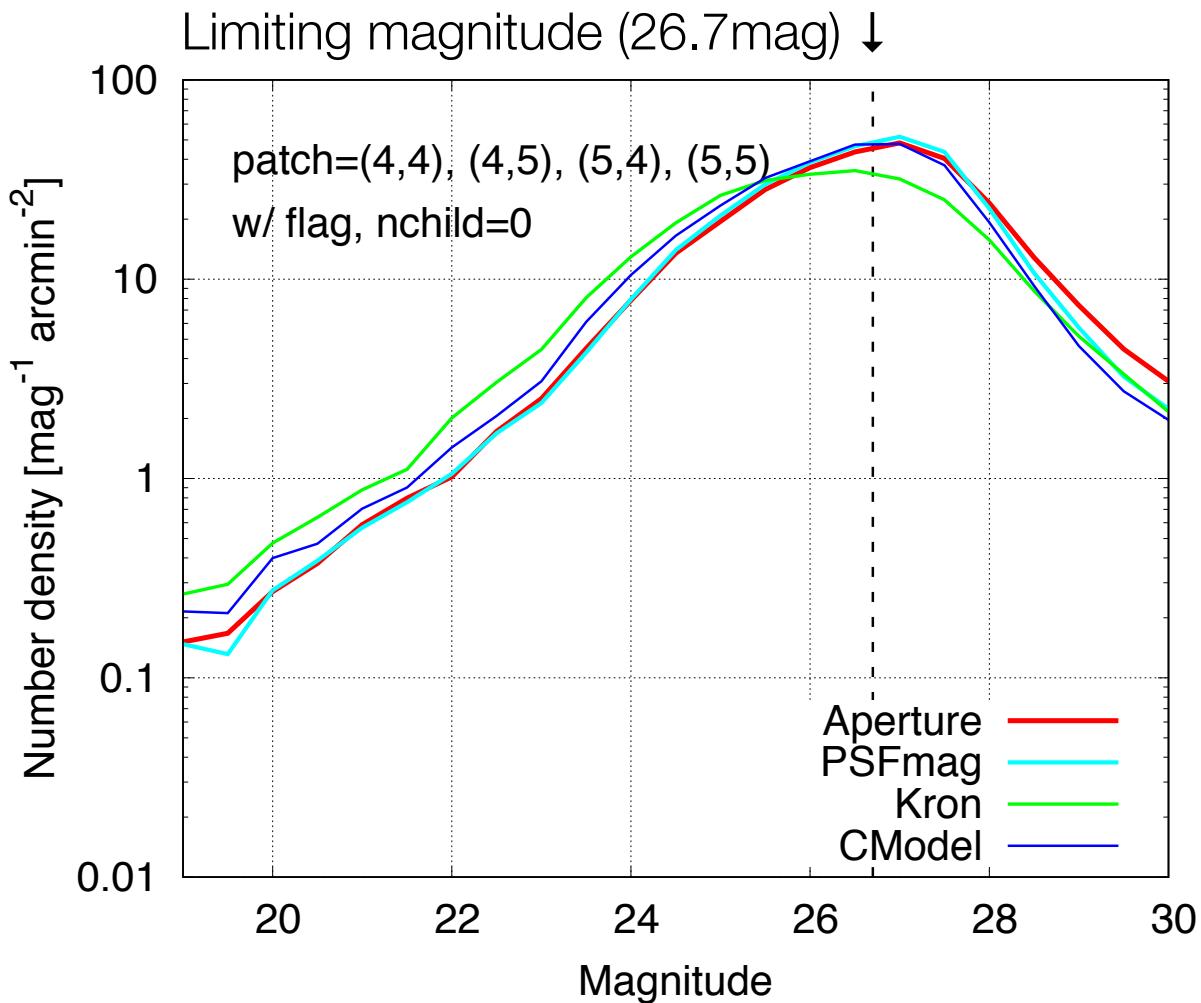
Image Quality Check -Limiting Magnitude-



- Limiting magnitude is measured with $2 \times \text{PSF} \phi$ random aperture.
- Lim. Mag. of **Reliable Stack** is ~26.7 mag
- Lim. Mag. of **Full Stack** is ~26.7 mag

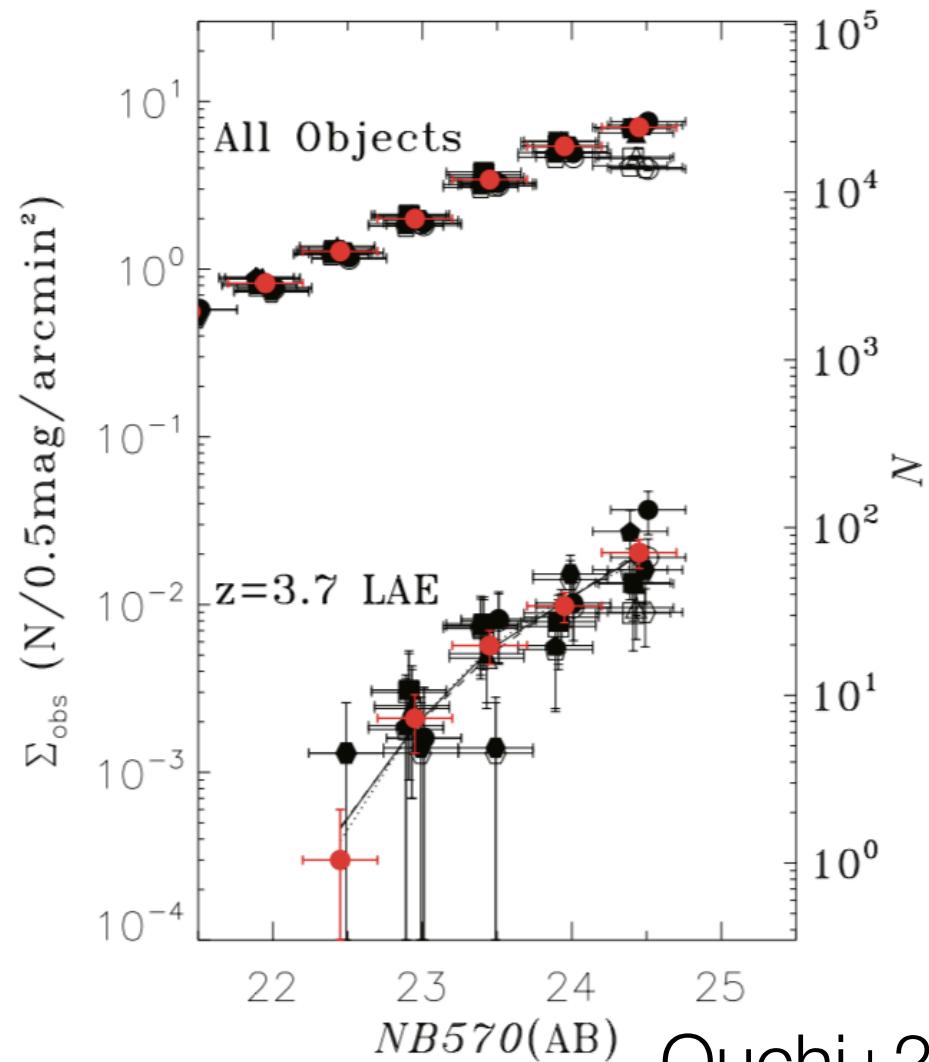
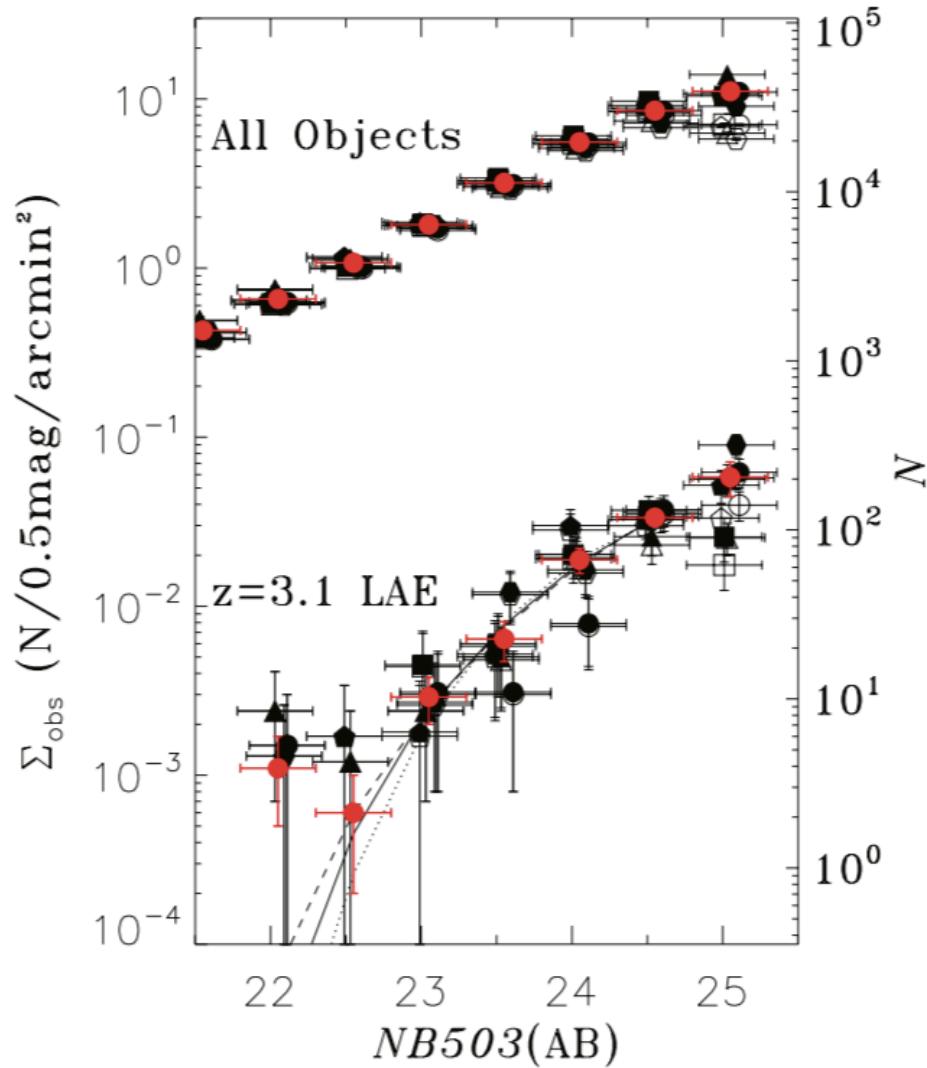
The limiting mag. of **Reliable Stack** is comparable to that of **Full Stack**.
In the following analysis, we use the catalog of **Reliable Stack**.

Catalog Quality Check -Number density-



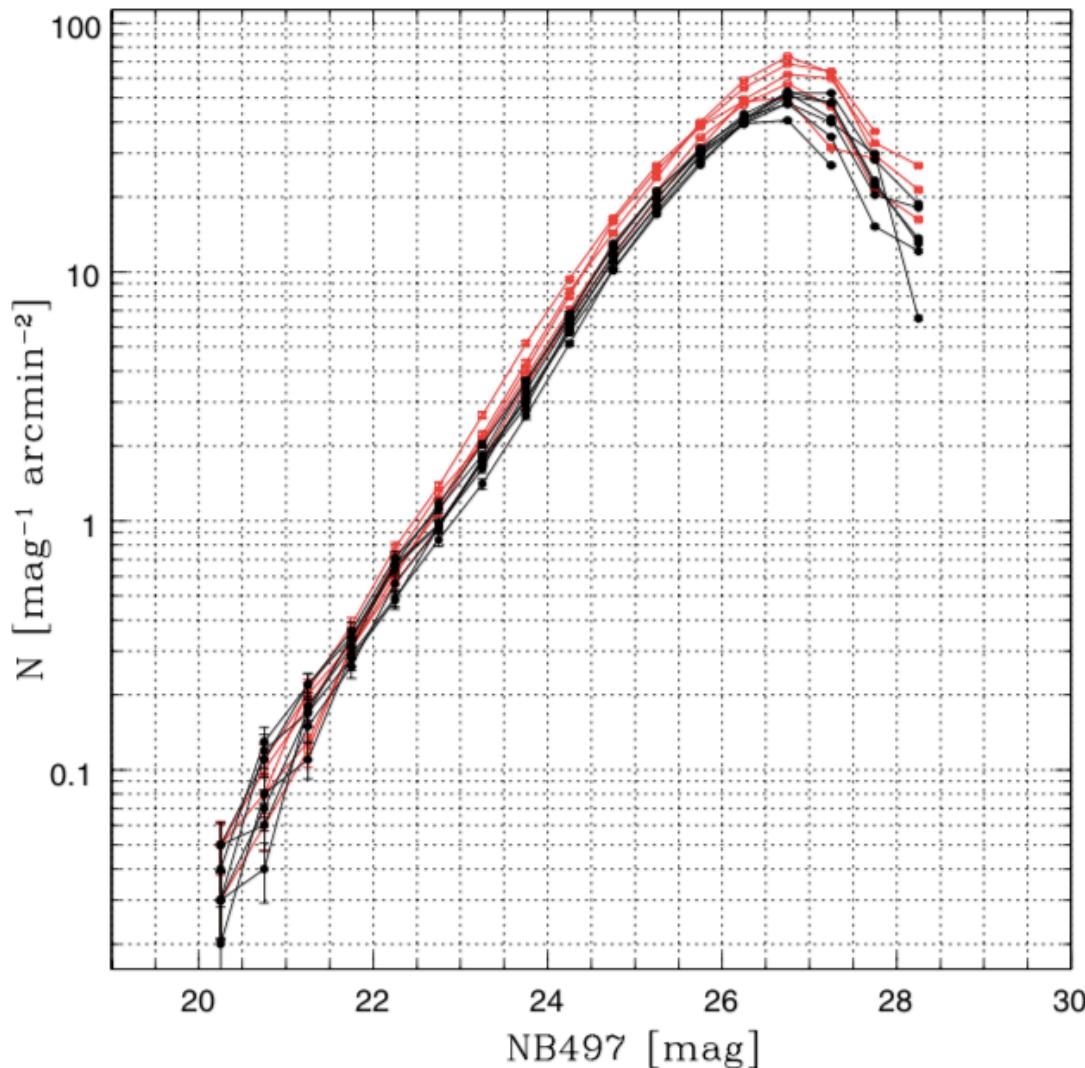
- Using 2x2 patch
 - Area = 501.76 [arcmin^2]
 - Mask region is **not** included
- Catalog Selection
 - `flux.*.flags IS False`
 - `flags.pixel.edge IS False`
 - `flags.pixel.interpolated.center IS False`
 - `flags.pixel.saturated.center IS False`
 - `flags.pixel.cr.center IS False`
 - `flags.pixel.bad IS False`
 - `centroid.sdss.flags IS False`
 - `deblend.nchild = 0`
 - `detect.is-patch-inner IS True`

Catalog Quality Check -Number density-



Ouchi+2008
Black -> SXDS
Red -> Averaged

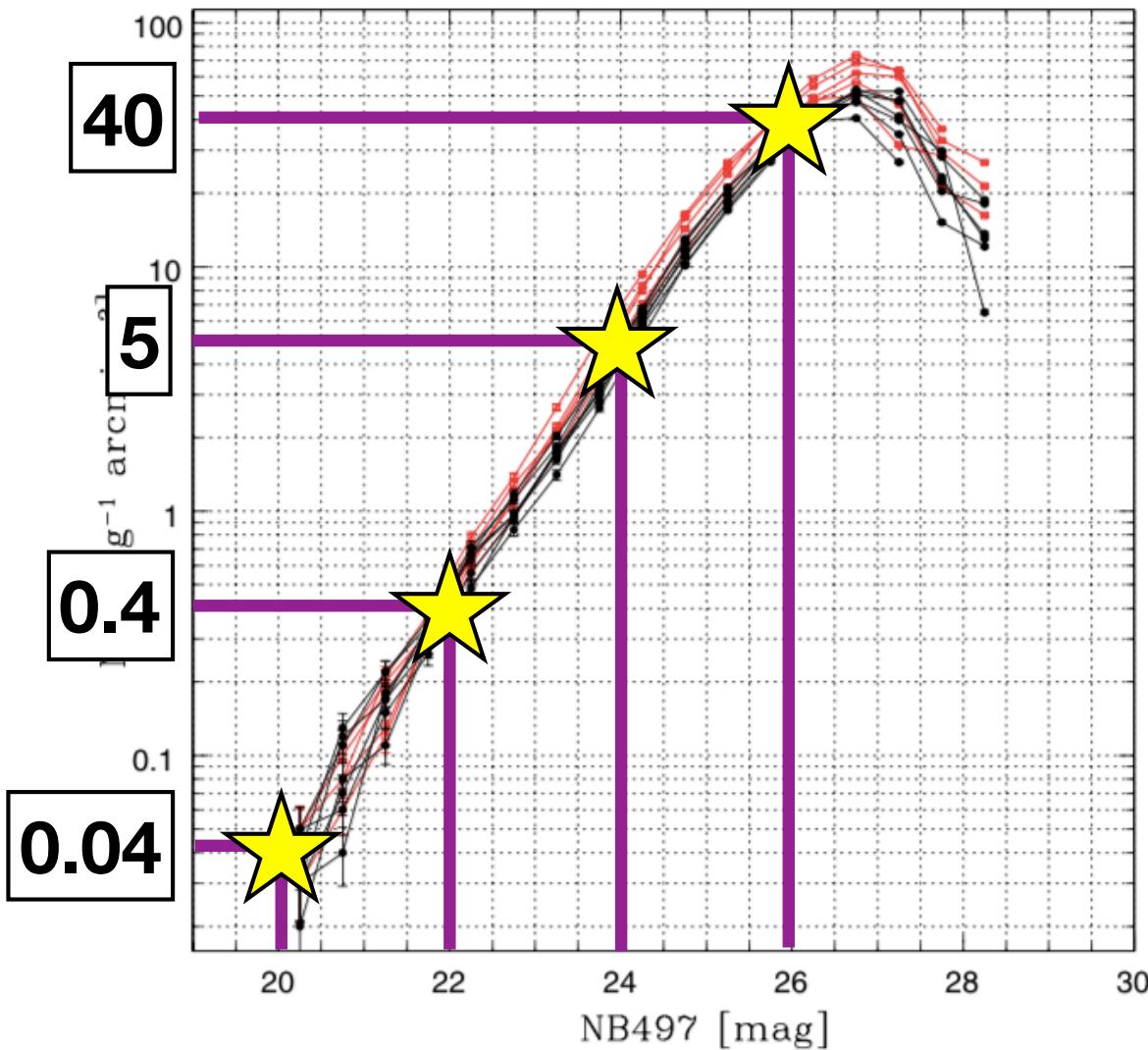
Catalog Quality Check -Number density-



- Important feature
 - > $\Sigma \sim 30\text{-}50$ @ 26mag
 - > $\Sigma \sim 5$ @ 24mag
 - > $\Sigma < 1$ @ 22mag
 - > $\Sigma < 0.1$ @ 20mag

Yamada+2012
Black -> SXDS, SDF
Red -> SSA22

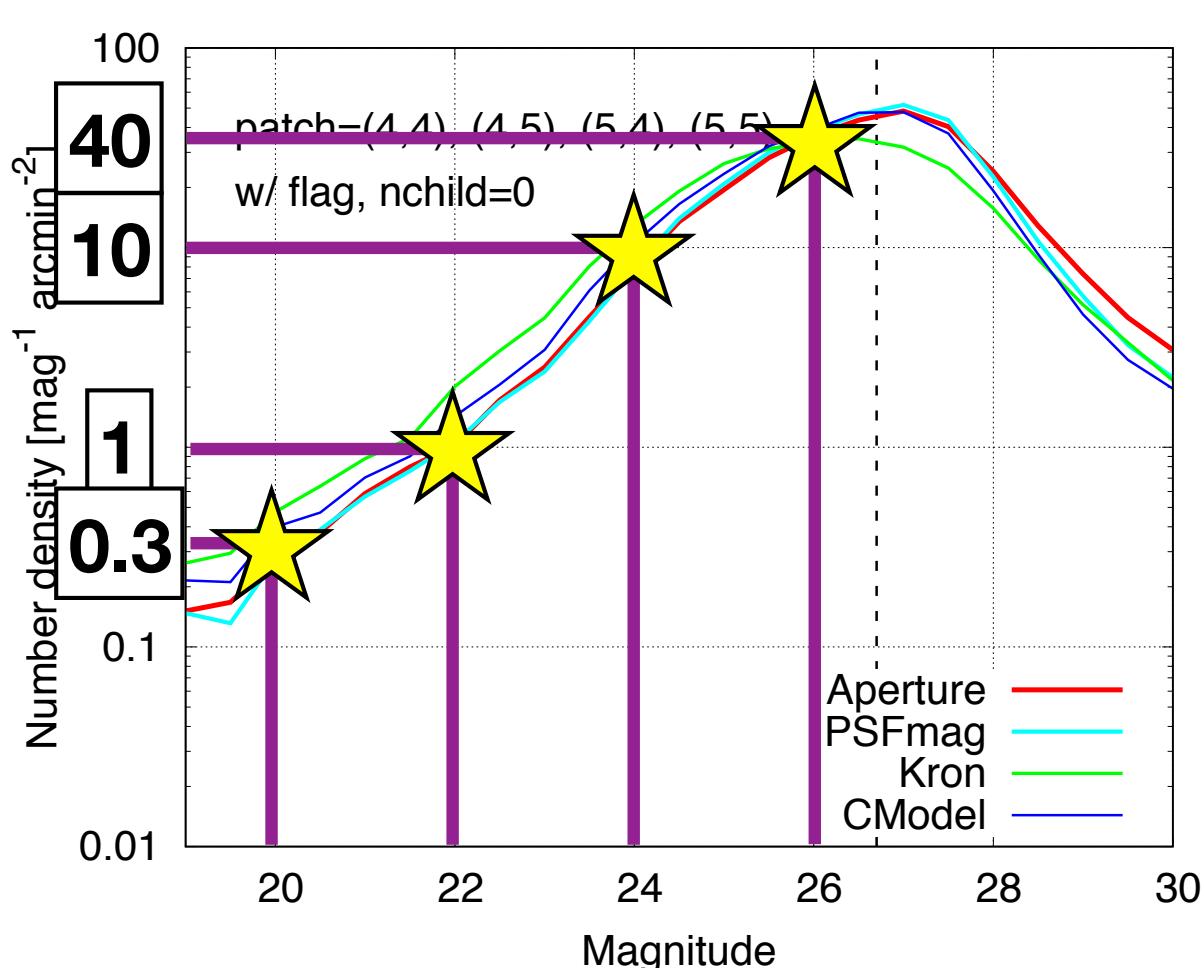
Catalog Quality Check -Number density-



- Important feature
 - > $\Sigma \sim 30\text{-}50$ @ 26mag
 - > $\Sigma \sim 5$ @ 24mag
 - > $\Sigma < 1$ @ 22mag
 - > $\Sigma < 0.1$ @ 20mag

Yamada+2012
Black -> SXDS, SDF
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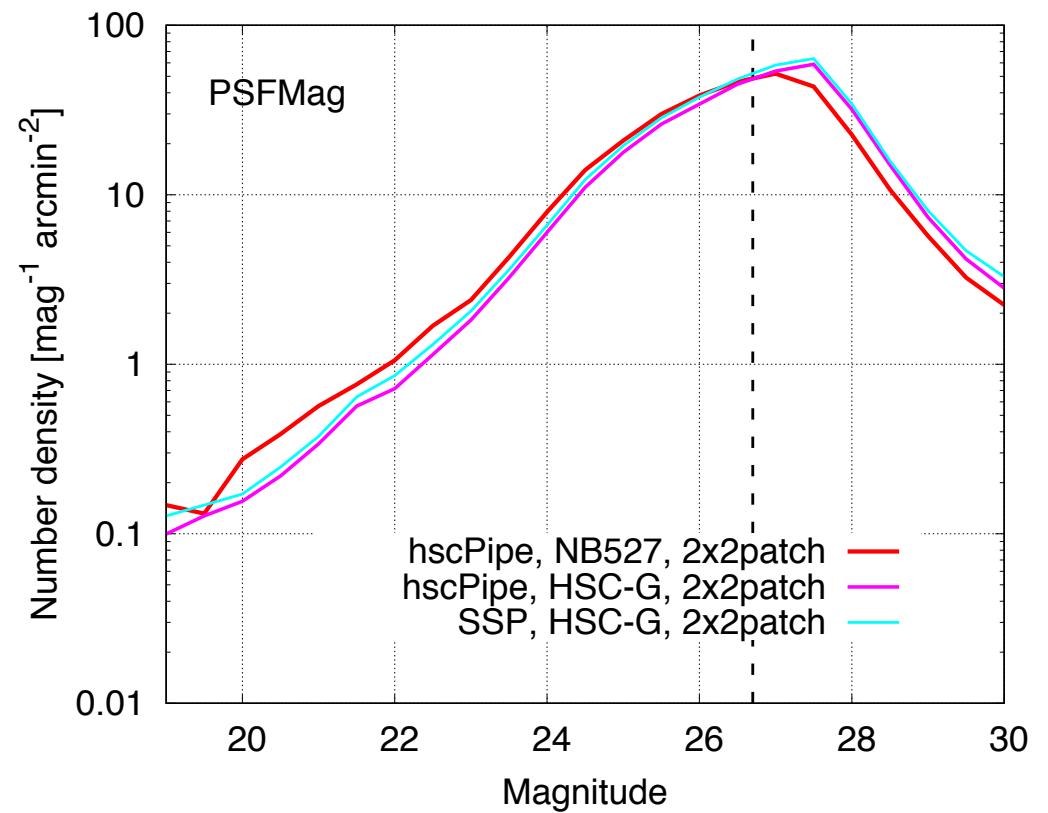
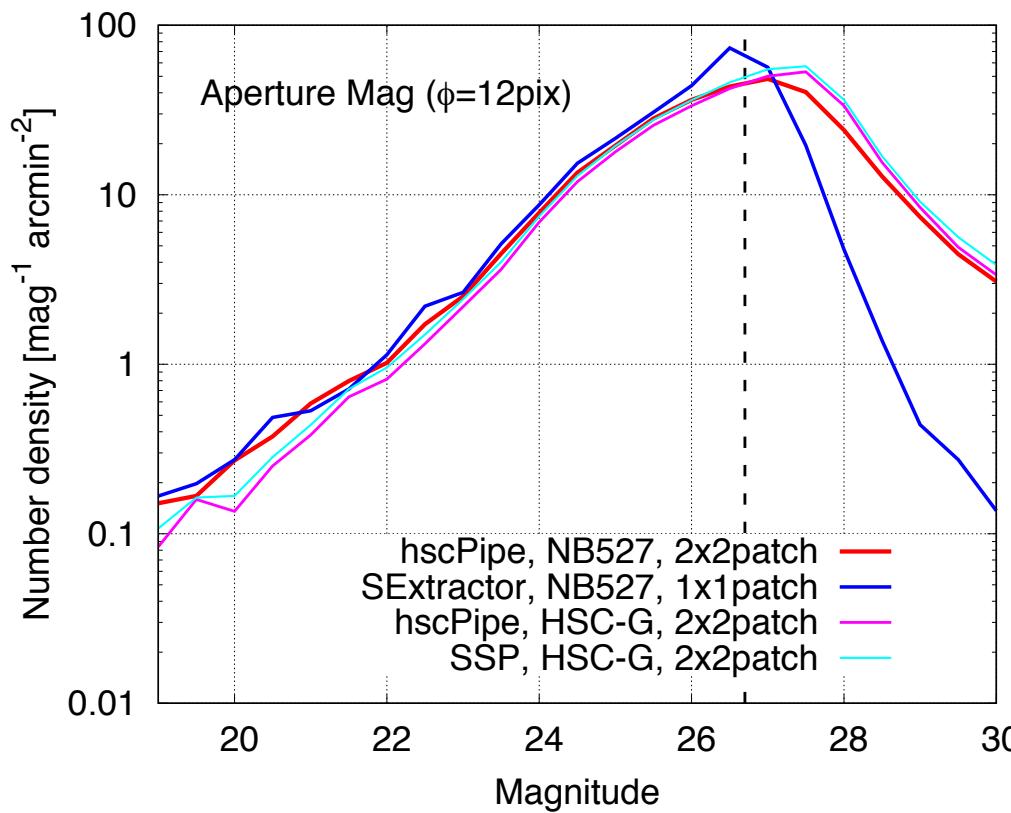
Catalog Quality Check -Number density-



- Important feature
 - > $\Sigma \sim 40$ @ 26mag
 - > $\Sigma \sim 10$ @ 24mag
 - > $\Sigma \sim 1$ @ 22mag
 - > $\Sigma > 0.1$ @ 20mag
- We can see the excess at Mag < 24.0
- Cosmic variance or false detection ?
- Kron magnitude shows strange shape.

Catalog Quality Check -Number density-

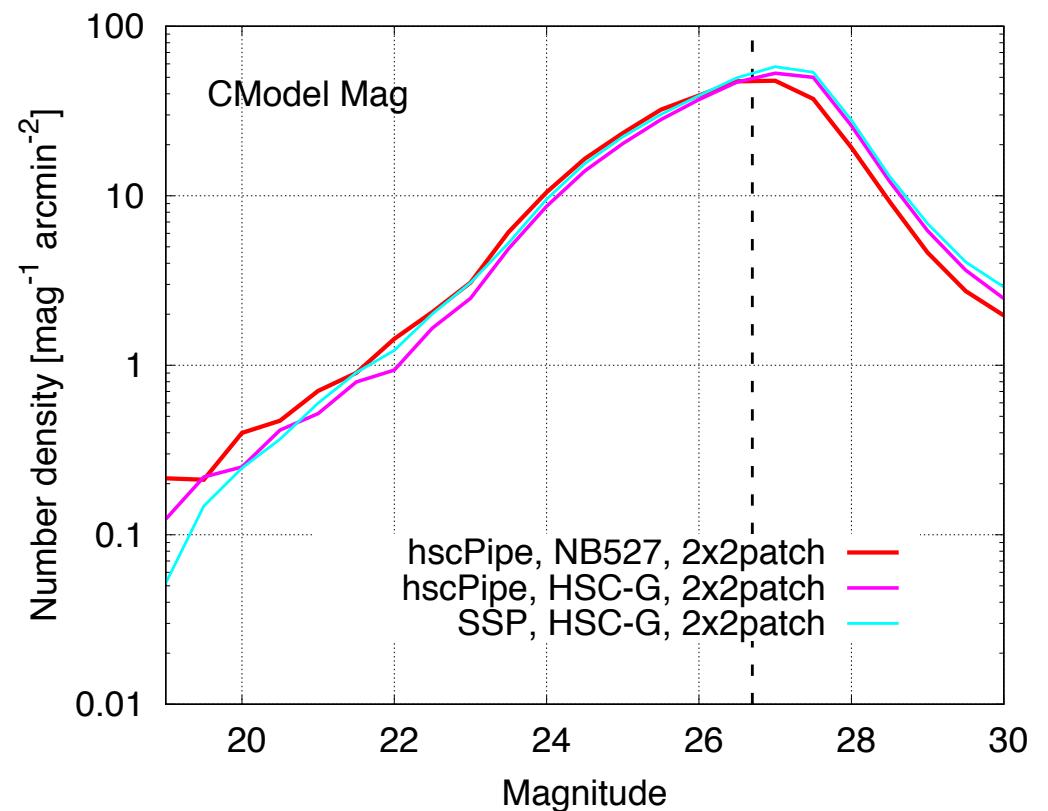
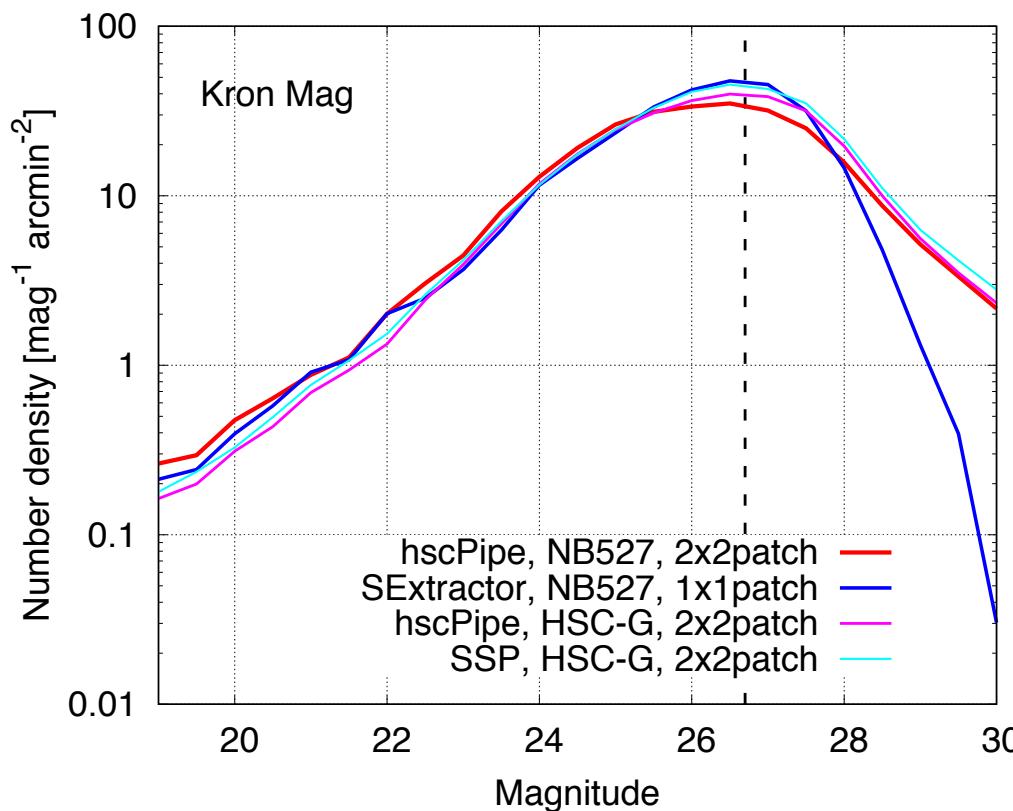
Comparison with various catalogs



Our catalog is consistent with the catalog of HSC-SSP and SExtractor.
Kron magnitude of NB527 has some problem ?

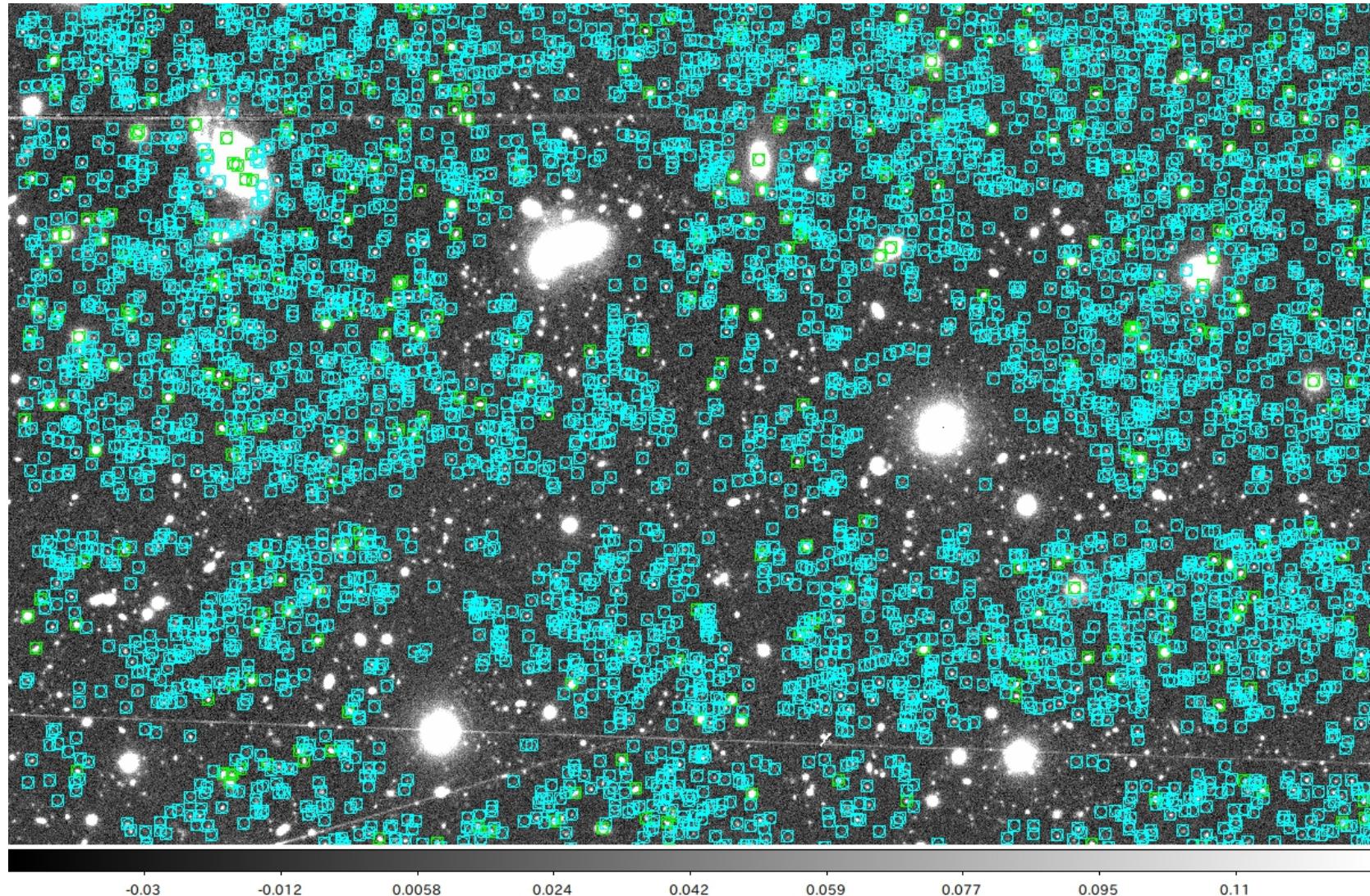
Catalog Quality Check -Number density-

Comparison with various catalogs



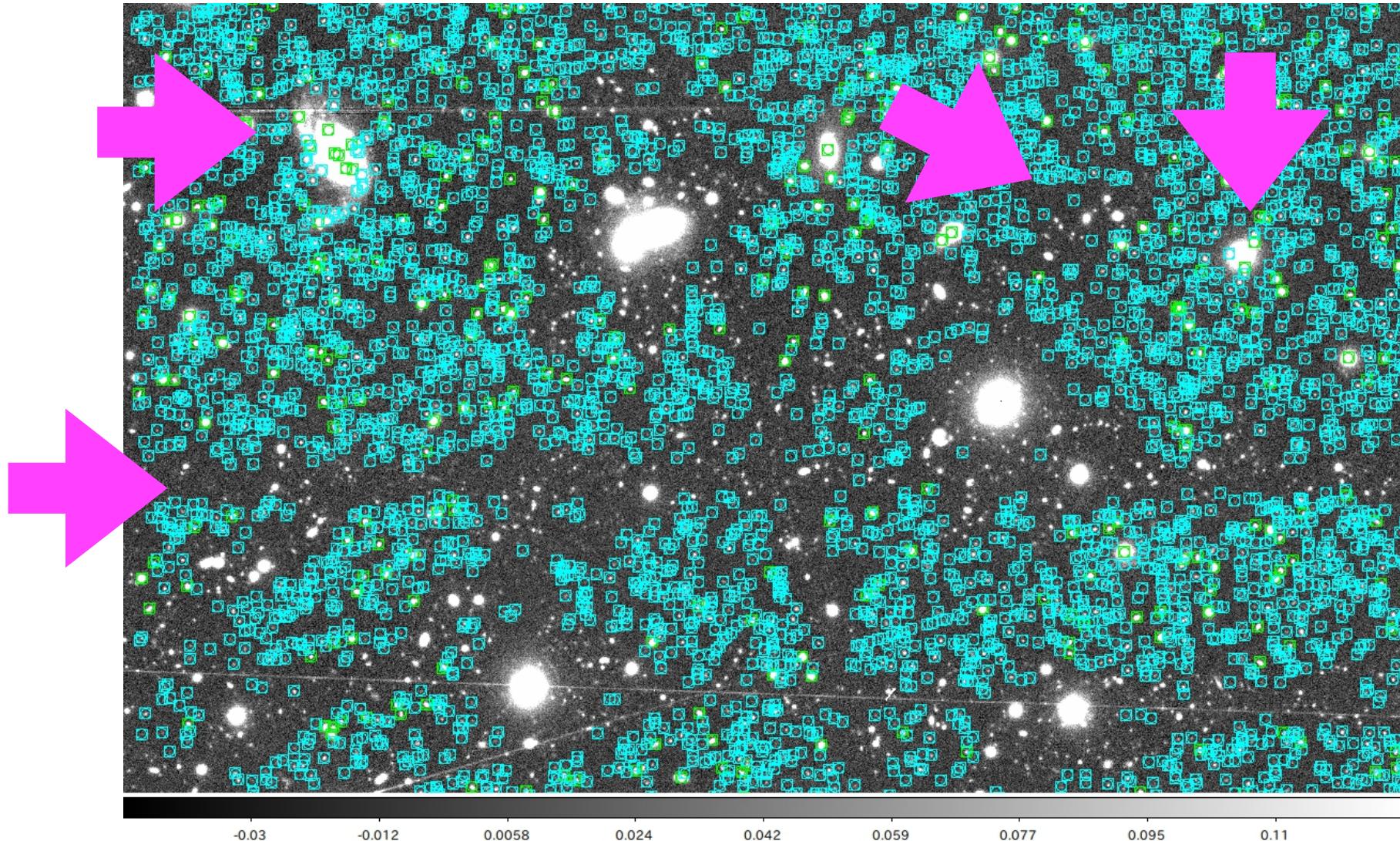
Our catalog is consistent with the catalog of HSC-SSP and SExtractor.
Kron magnitude of NB527 has some problem ?

Catalog Quality Check -Visual check-



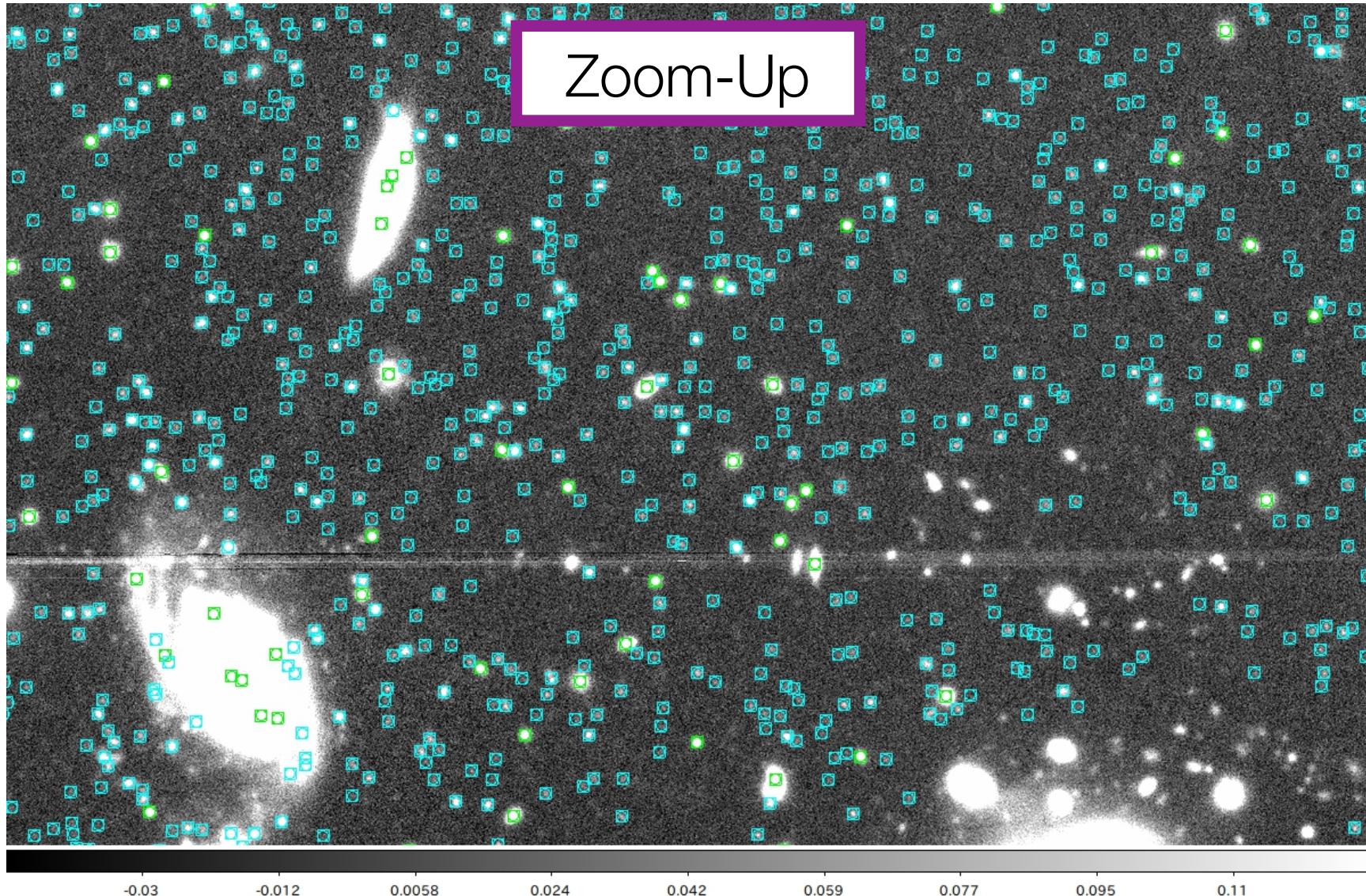
Cyan : $24.0 < \text{CModel_mag} < 27.25$ / Green : $\text{CModel_mag} < 24.0$

Catalog Quality Check -Visual check-



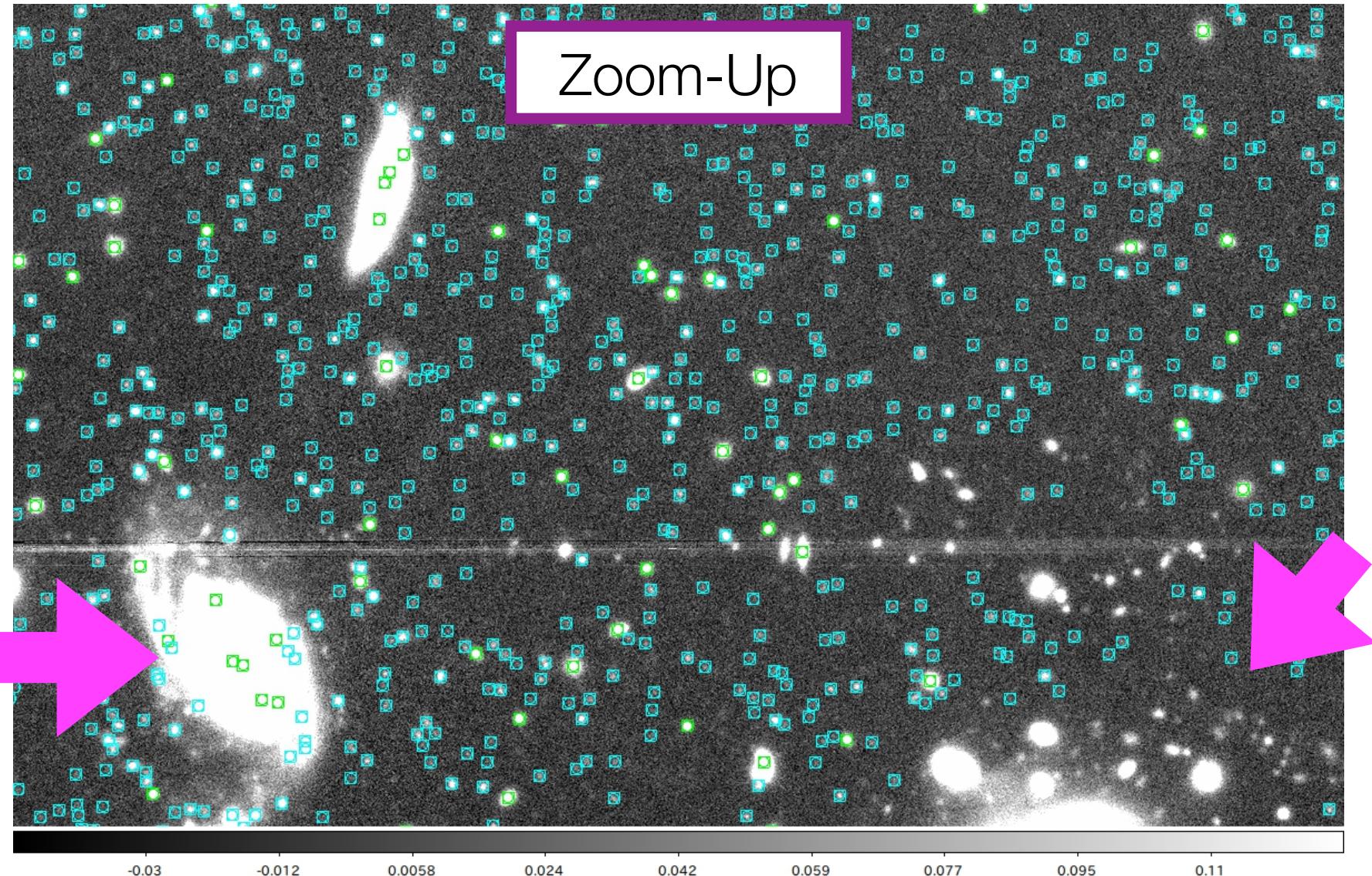
Cyan : $24.0 < \text{CModel_mag} < 27.25$ / Green : $\text{CModel_mag} < 24.0$

Catalog Quality Check -Visual check-



Cyan : $24.0 < \text{CModel_mag} < 27.25$ / Green : $\text{CModel_mag} < 24.0$

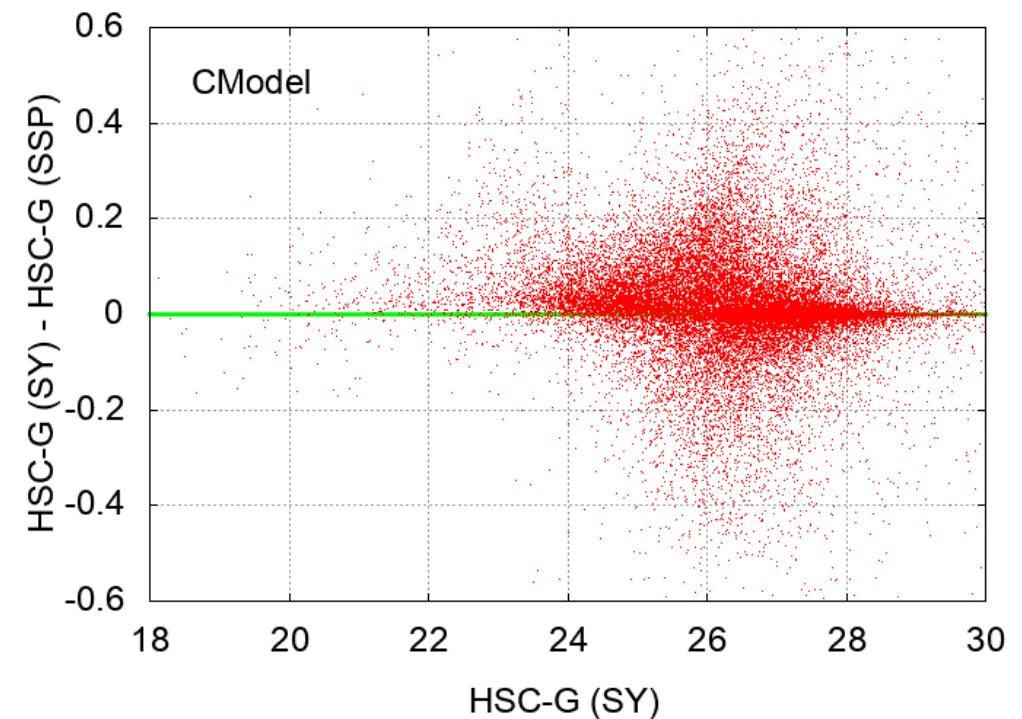
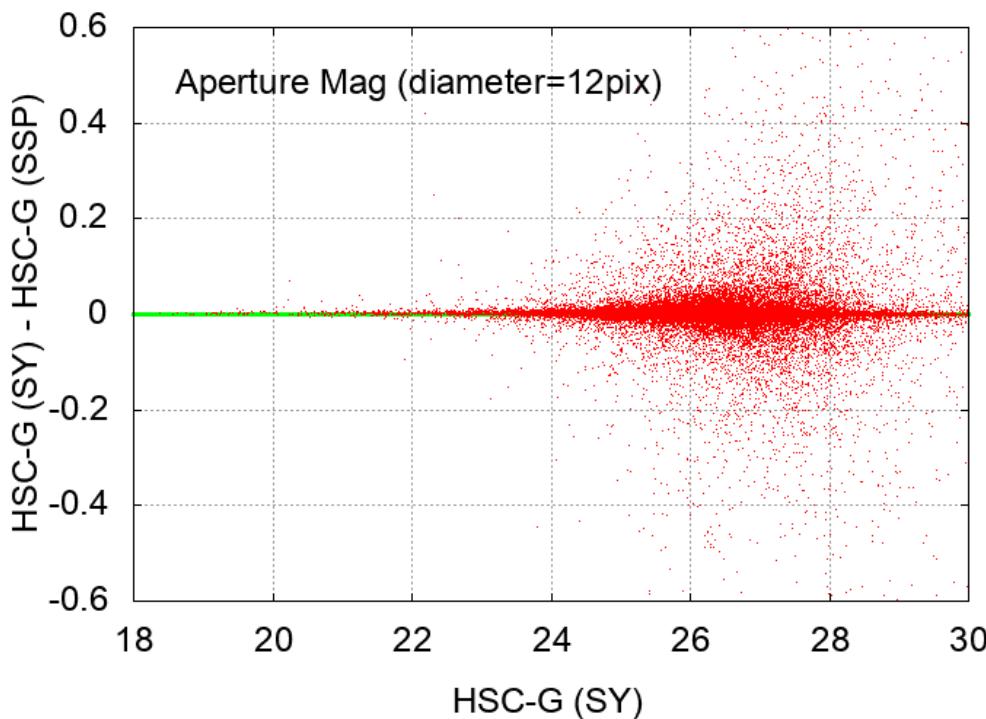
Catalog Quality Check -Visual check-



Cyan : $24.0 < \text{CModel_mag} < 27.25$ / Green : $\text{CModel_mag} < 24.0$

Catalog Quality Check -Photometry check-

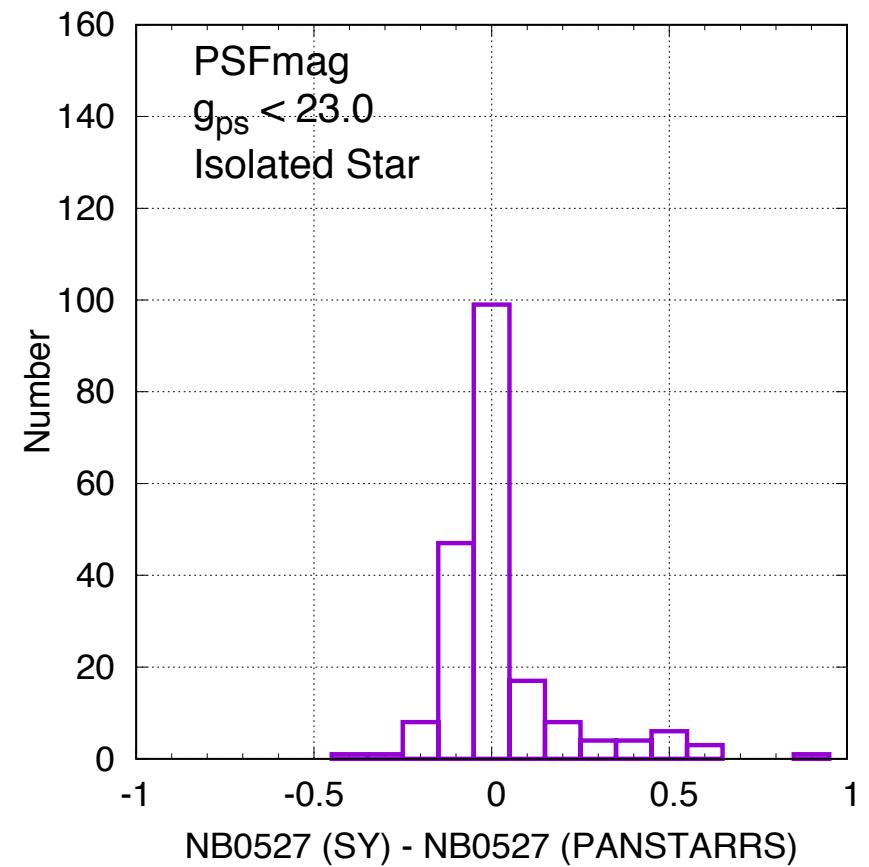
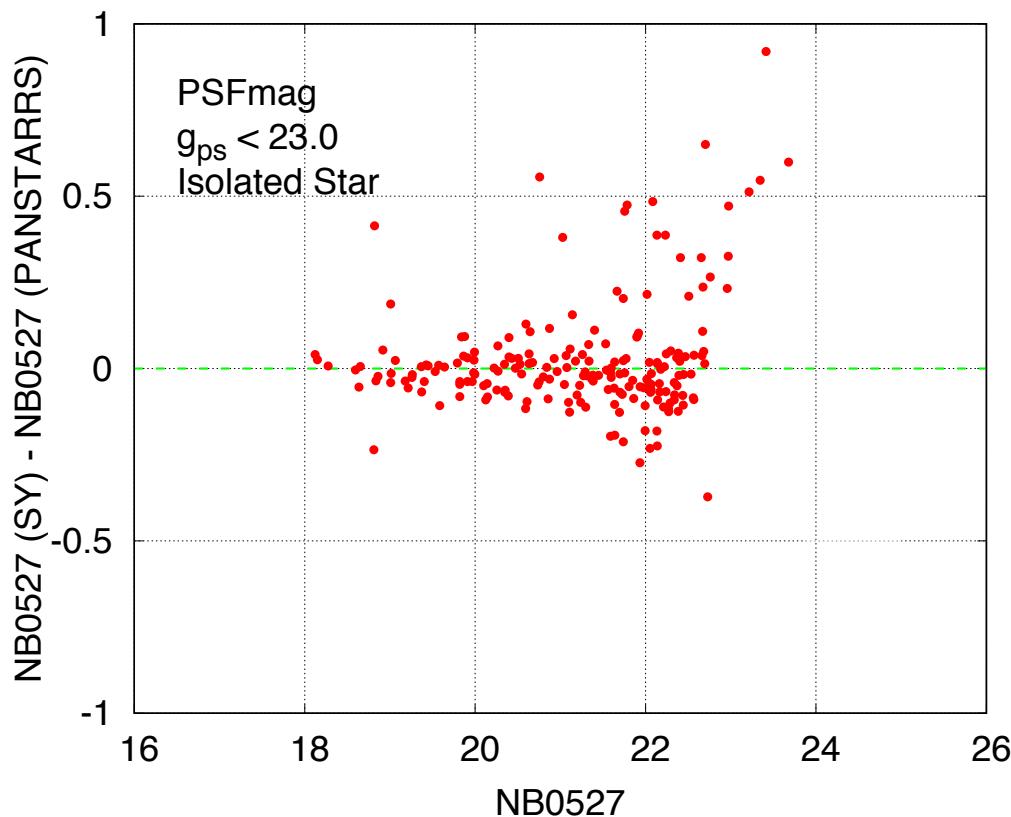
Comparison with various catalogs



Our catalog is consistent with the catalog of HSC-SSP.
 $\Delta\text{mag} < 0.1$

Catalog Quality Check -Photometry check-

Comparison with various catalogs

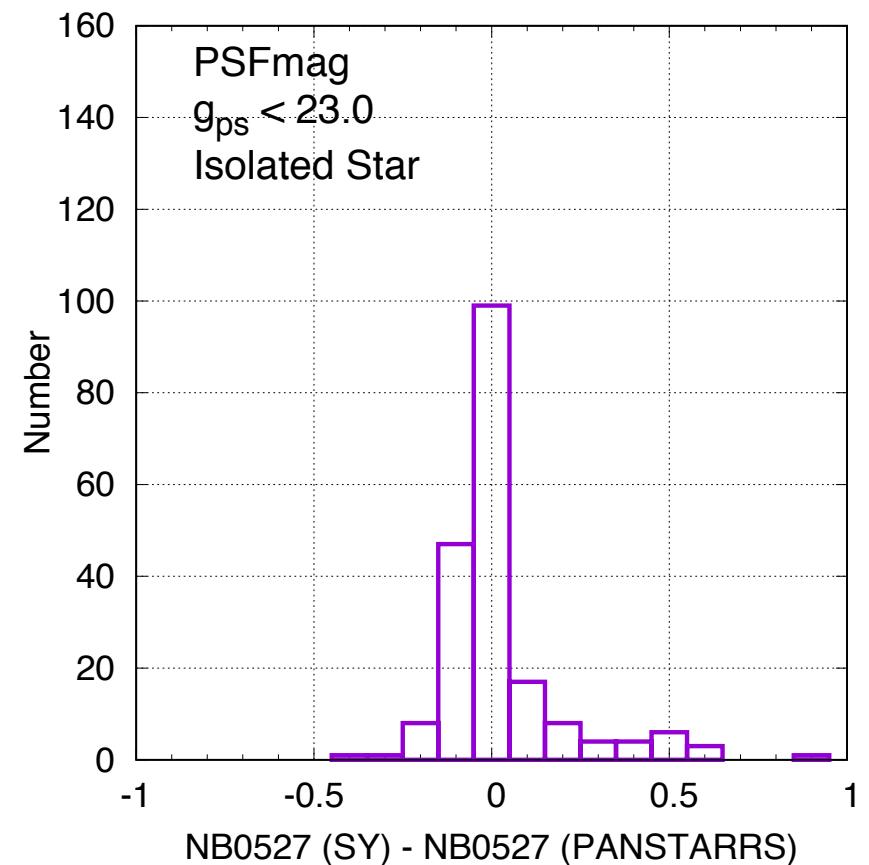
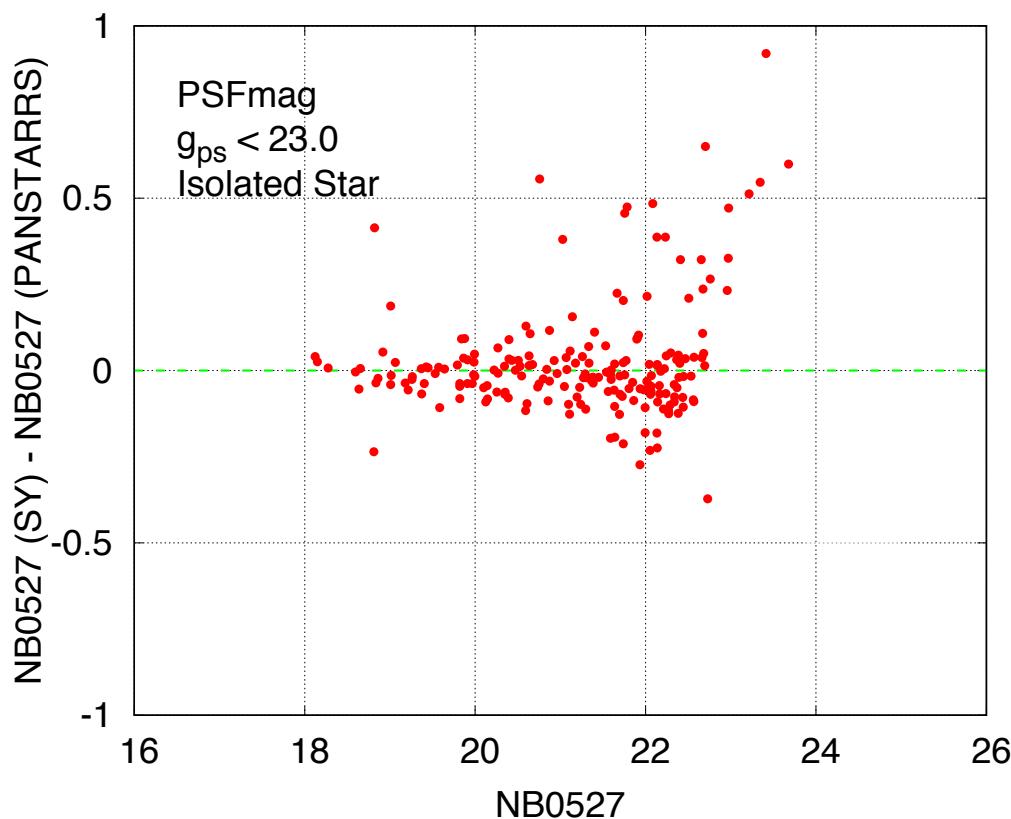


Color Term : Photometric calibration

$$\text{NB0527_HSC} = g_{PS} + C0 + C1 (g_{PS} - r_{PS}) + C2 (g_{PS} - r_{PS})^2$$

Catalog Quality Check -Photometry check-

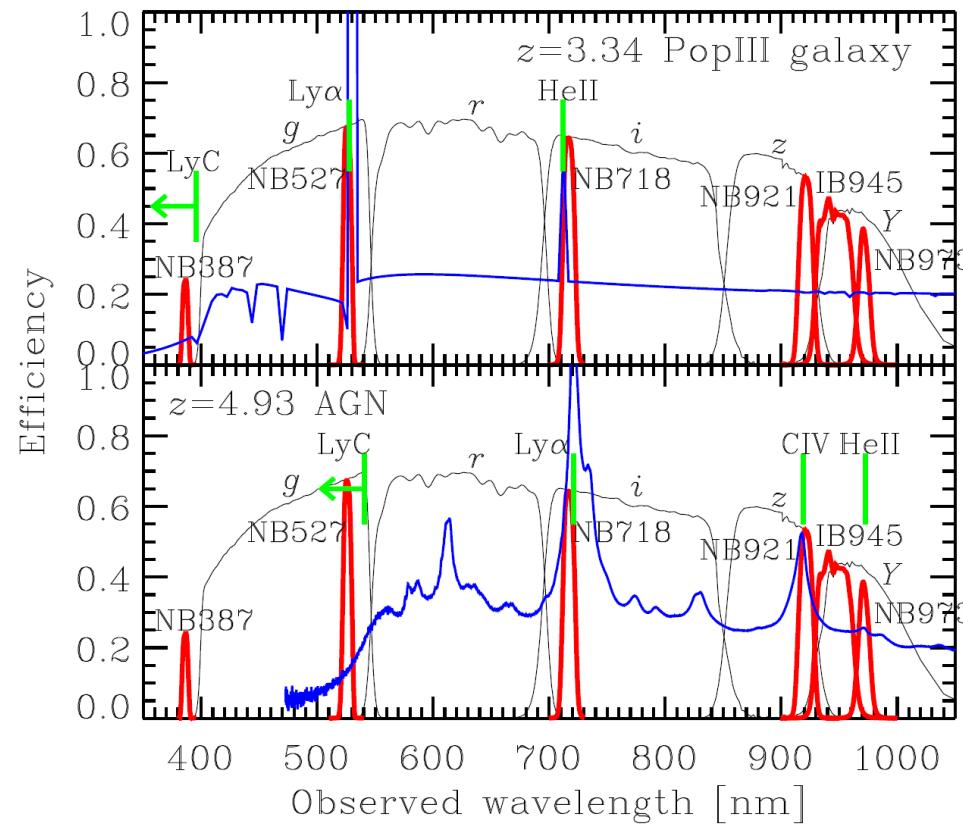
Comparison with various catalogs



PSFmag. of our catalog is consistent with (or slightly brighter than) that of PANSTARRS.

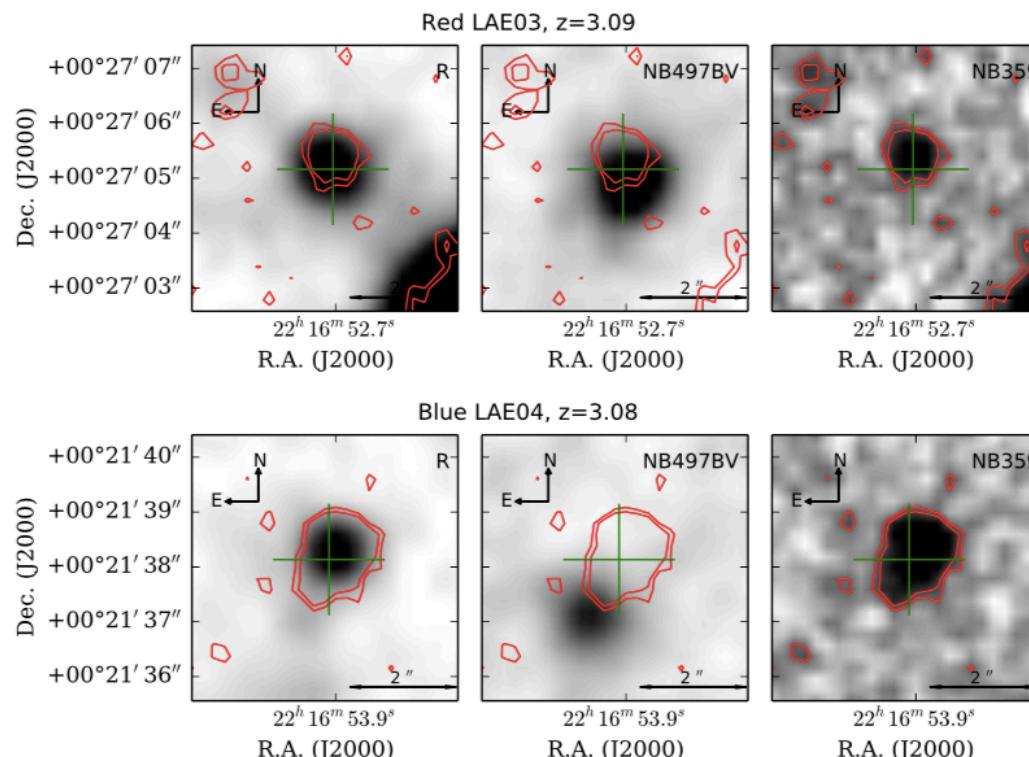
Future prospects

- Direct detection of Lyman continuum
 - > NB387 (LyC) /NB527 (Ly α) : LAEs/LBGs@z=3.3
 - > NB527 (LyC) /NB718 (Ly α) : LAEs/LBGs@z=4.9



Future prospects

- Direct detection of Lyman continuum
 - > NB387 (LyC) /NB527 (Lya) : LAEs/LBGs@ $z=3.3$
 - > NB527 (LyC) /NB718 (Lya) : LAEs/LBGs@ $z=4.9$



Micheva+2017
Left -> R (continuum)
Middle -> NB497-BV (Lya)
Right -> NB359 (LyC)

Call for Proposals

This document is also available in [PDF format](#).

Semester S19A: February 1, 2019 -- July 31, 2019

Subaru Telescope, National Astronomical Observatory of Japan

Subaru Telescope invites observing proposals for Semester S19A. Since each instrument has its own specific restrictions/conditions, applicants are required to consult the relevant [instrument page](#) when preparing their proposals. Please also refer to [How to Submit via webform](#), [Open Use Policy](#) and [Telescope webpage](#).

Open Use Schedule for S19A

Deadline of Normal/Intensive Program Submission	September 13 (Thu), 2018 12:00 (Noon) in Japan Standard Time (i.e., September 13, 3:00 am in UT)
Deadline of Service/Filler Program Submission	October 11 (Thu), 2018 12:00 (Noon) in Japan Standard Time (i.e., October 11, 3:00 am in UT)
Time Allocation Committee	late October
Notification of selection results	early December

The "BETA" images and catalog of HSC/NB527
will be released.

If you are interested in the data, please let us know !

Thank you for your attention !!