

Looking ahead

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Most Distant Galaxies

- Probing the cosmic dawn -

Lyman Alpha Emitters

Multi Slices in z for SDF to see evolution

NB711 $z=4.8$

NB816 $z=5.7$

Shimasaku et al. 2006

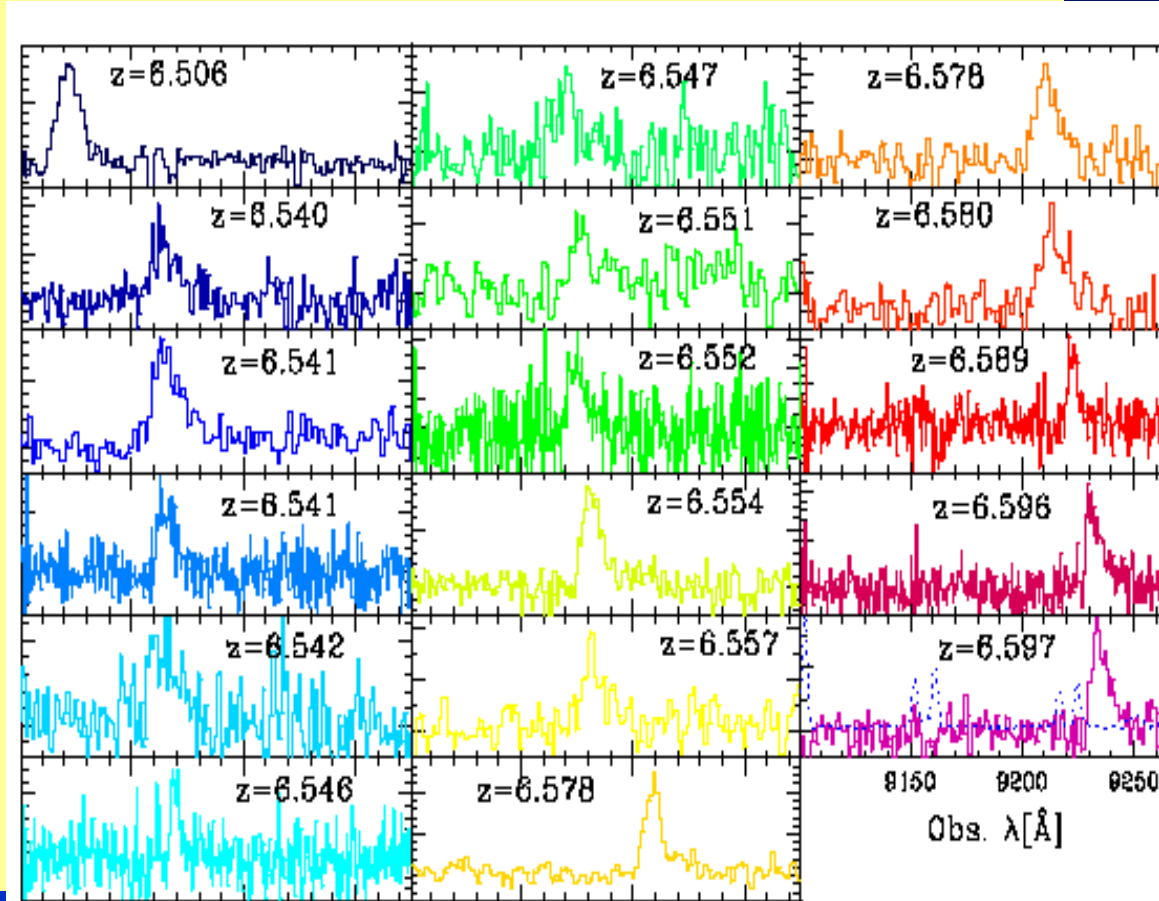
NB921 $z=6.6$

Kashikawa et al. 2006

NB973 $z=7.0$

Iye et al. 2006

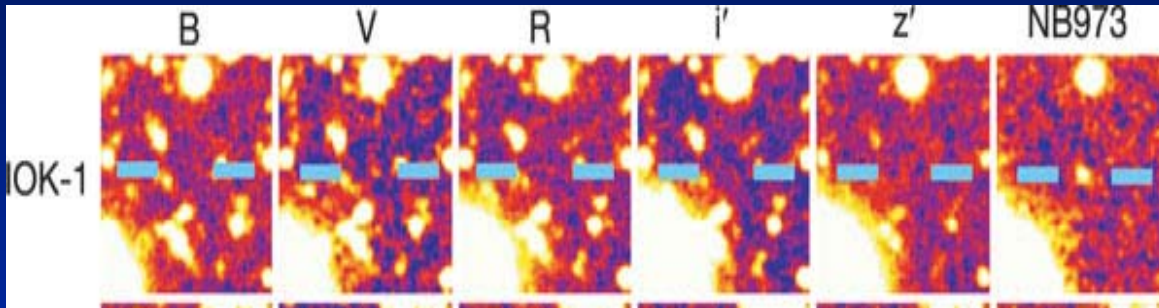
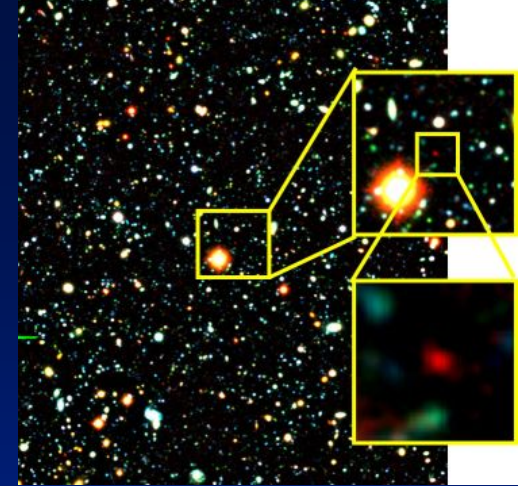
(NB1006 $z=7.3$)



The most distant galaxy with secure spectroscopic redshift measurement at $z=6.964$

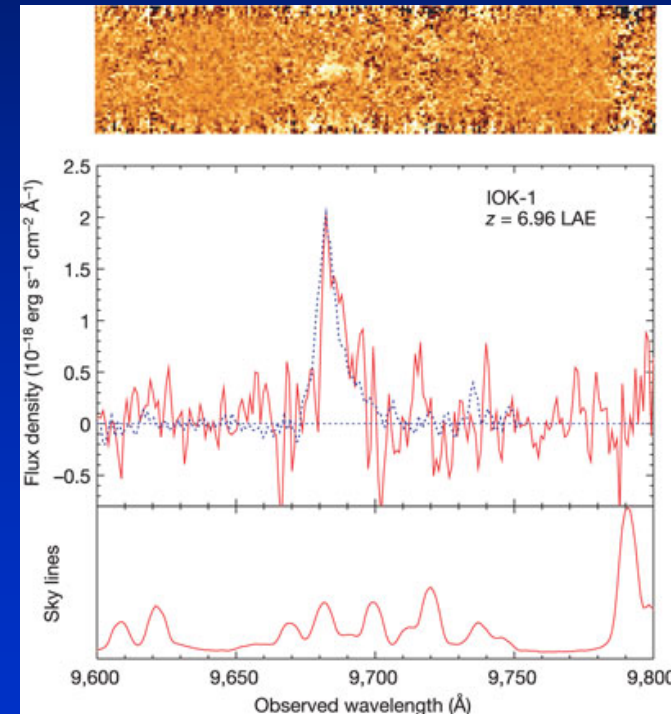
Iye et al. 2006, Nature, 443, 186

Narrow-band (9730Å) survey of $z=7.0$ LAEs in the SDF



2nd 5 sigma candidate IOK-2 (at $z=7.02$) was re-observed and confirmed not a real object.

only one object among 41,533 NB973 objects in one Suprime-Cam FoV!



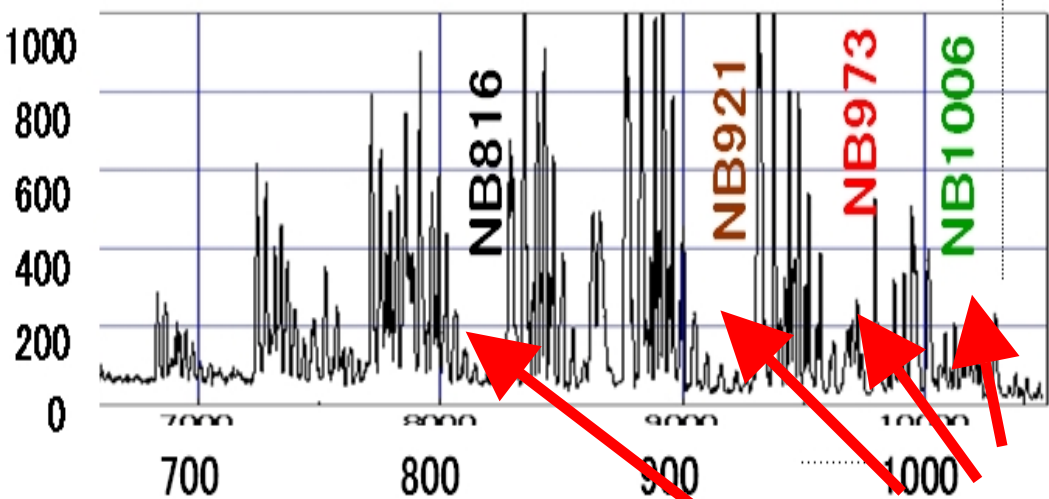
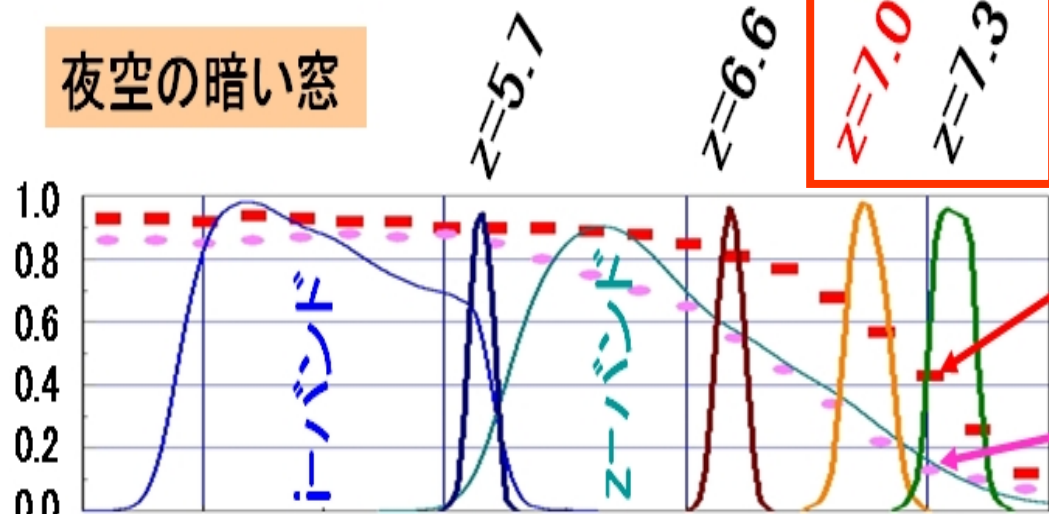
IOK-1 : named after Iye, Ota, and kashikawa

Filters to search for Lyman α Emitters

夜空の暗い窓

透過率

夜光強度



波長(nm)

OH night sky lines

NBF1006

Looks black as it transmits only IR light

新CCD

効率4倍

旧CCD



Guinness record (for 943days)

* New record will arrive at 95% confidence level at earliest in 24 days and at latest in 98 years (if the date of discovery and today are not correlated, which is **WRONG**).

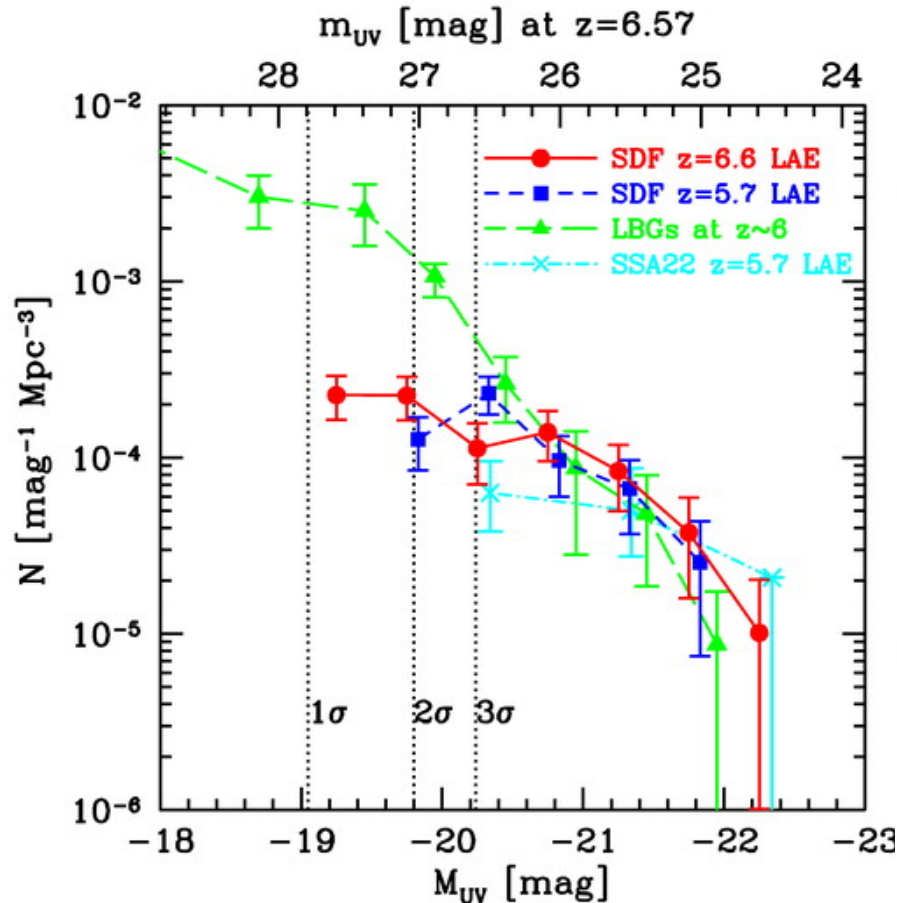
* New observations for $z=7.3$ LAEs (Feb–Apr, 2009).

Table 1: Top 10 most distant galaxies with measured redshift (Feb. **Apr. 8, 2009**)

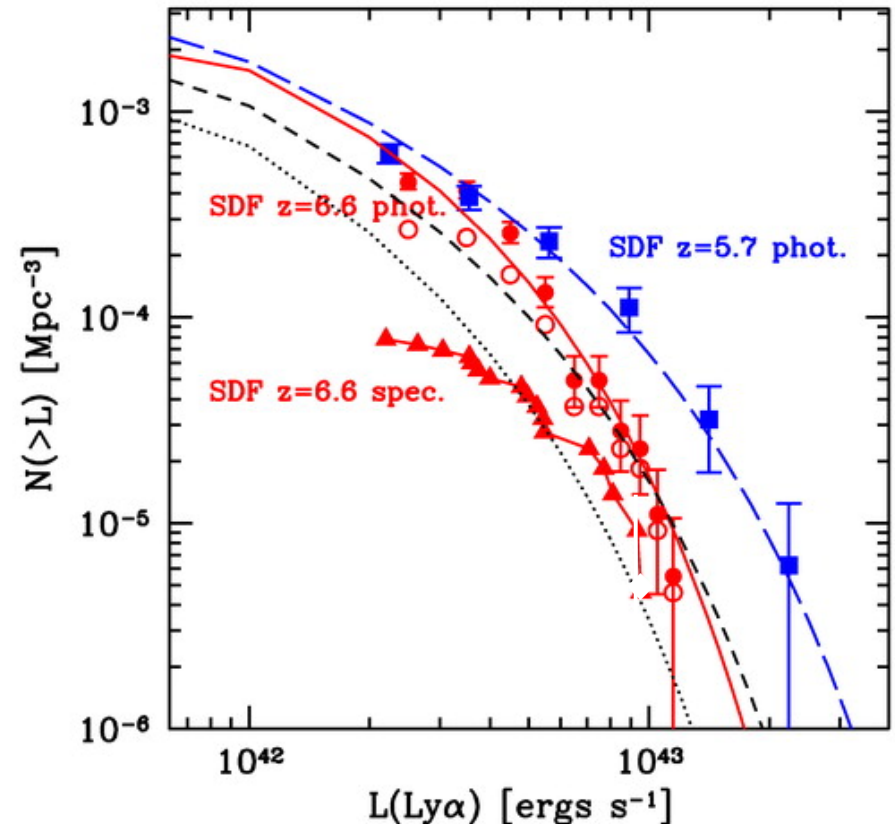
Rank	ID	Coordinates	Redshift	0.1Gyr	Paper	Date
1	IOK-1	J132359.8+272456	6.964	128.8	Iye et al.	Sep. 14, 2006
2	SDF ID1004	J132522.3+273520	6.597	128.2	Taniguchi et al.	Feb. 25, 2005
3	SDF ID1018	J132520.4+273459	6.596	128.2	Kashikawa et al.	Apr. 25, 2006
4	SXDF Himiko	in SXDS field	6.595	128.2	Ouchi et al.	Jul. 25, 2008
5	SDF ID1030	J132357.1+272448	6.589	128.2	Kashikawa et al.	Apr. 25, 2006
6	SDF ID91163	J132343.4+272954.5	6.587	128.2	Kashikawa et al.	Feb. 2009
7	SDF ID91988	J132342.2+272644.5	6.587	128.2	Kashikawa et al.	Feb. 2009
8	SDF ID71101	J132450.7+272159.7	6.587	128.2	Kashikawa et al.	Feb. 2009
9	SDF ID1007	J132432.5+271647	6.580	128.2	Taniguchi et al.	Feb. 25, 2005
10	SDF ID1008	J132518.8+273043	6.578	128.2	Taniguchi et al.	Feb. 25, 2005

Decrease in bright LAE number density implies galaxy evolution or increase in IGM opacity Iye et al. Nature 443, 186, 2006

UV continuum LF at 1255Å



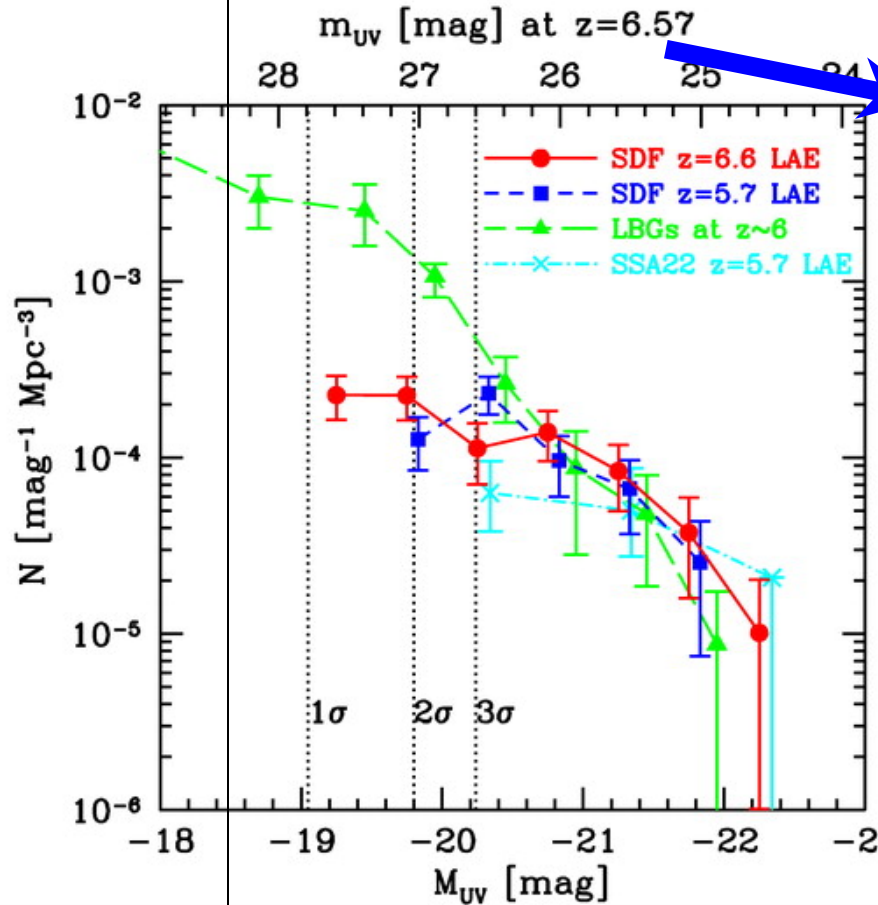
Lyman α LF



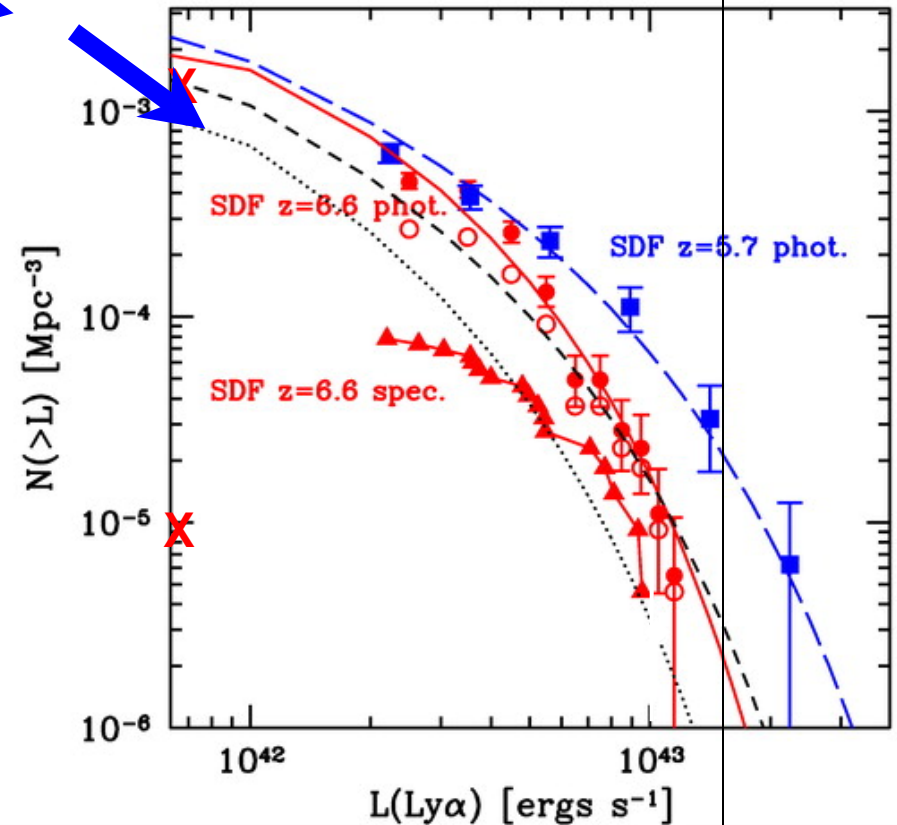
Lyman Alpha Emitter luminosity density Evolution

Shimasaku2006(z=5.7), Kashikawa2006(z=6.6), Iye2006(z=7.0)

UV continuum LF at 1255Å



Lyman α LF



Decrease in Number Density of LAEs at high redshift

- Clear decrease in SDF

$z=5.7 \Rightarrow 6.6 \Rightarrow 7.0 \Rightarrow 7.3$

(A) Galaxy build-up evolution?

\Rightarrow No!

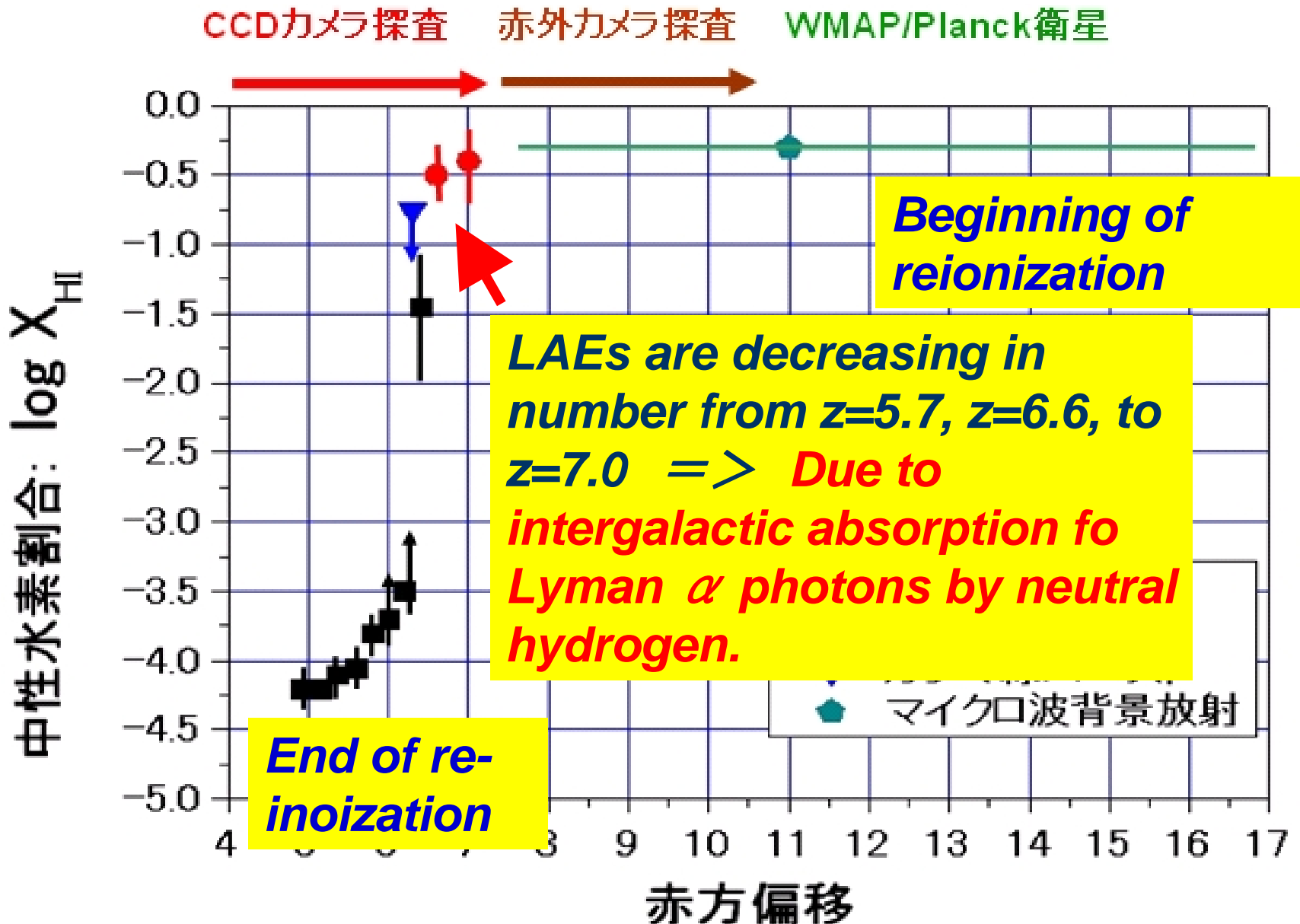
because no clear decrease in UV continuum.

(B) Lyman alpha photons scattered by HI

\Rightarrow Likely!

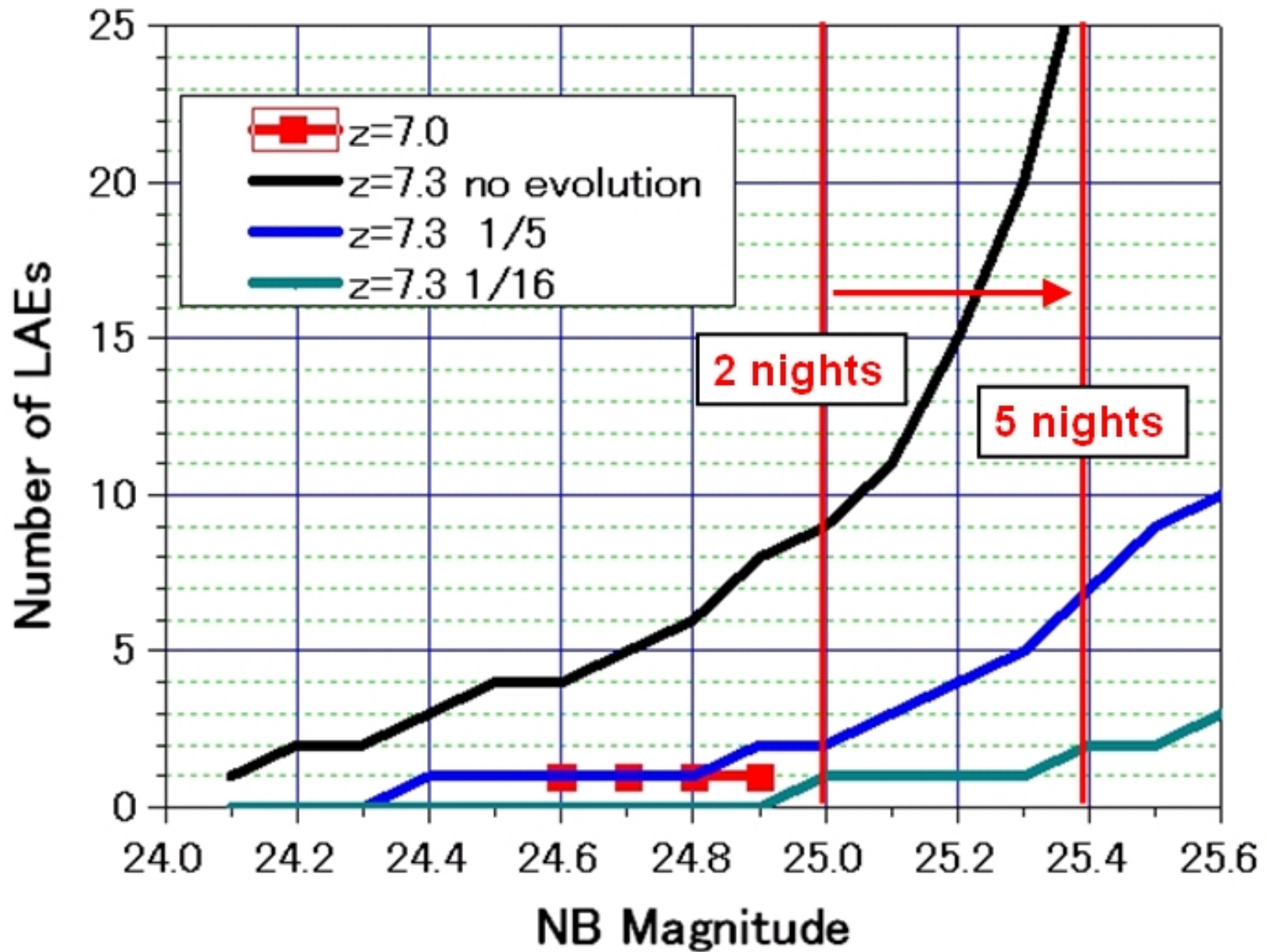
But observed only in 1 field (SDF).

Cosmic Dawn



S09A-065観測

- 2008/10 XX、2009/2 OO、2009/4 XO
- 合計20時間積分確保
- 予想限界等級NB1006=25.2
- $Z=7.3$ LAE
- 候補天体選定(夏頃まではかかる)
- 分光(秋以降)
- あれば \Rightarrow z 新記録
- 無ければ \Rightarrow 再電離終焉期への更なる制限



世界天文年 2009/4/3 80 Observatories



Ad

Courtesy H. Akitaya



➤ LAEと再電離の問題

- すばるの限界 (~2009)
- JWSTでの進展 (2013~) Deep
- WISHでのだめ押し (2016~) Wide
- TMT+LGSAOで (2018~) 高解像、分光

➤ Synergy with TMT

- 本日TMT SAC (Pasadena: 柏川、臼田参加)
- H22概算要求でTMT開発経費要求を決意(本日)
- TMTの観測装置検討にも参加しよう!!!