

Surveys Espectroscopios: BOSS, eBOSS y DESI.

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Outline

- Mapping the Large Scale Structure.



Baryonic Oscillations Spectroscopic Survey.



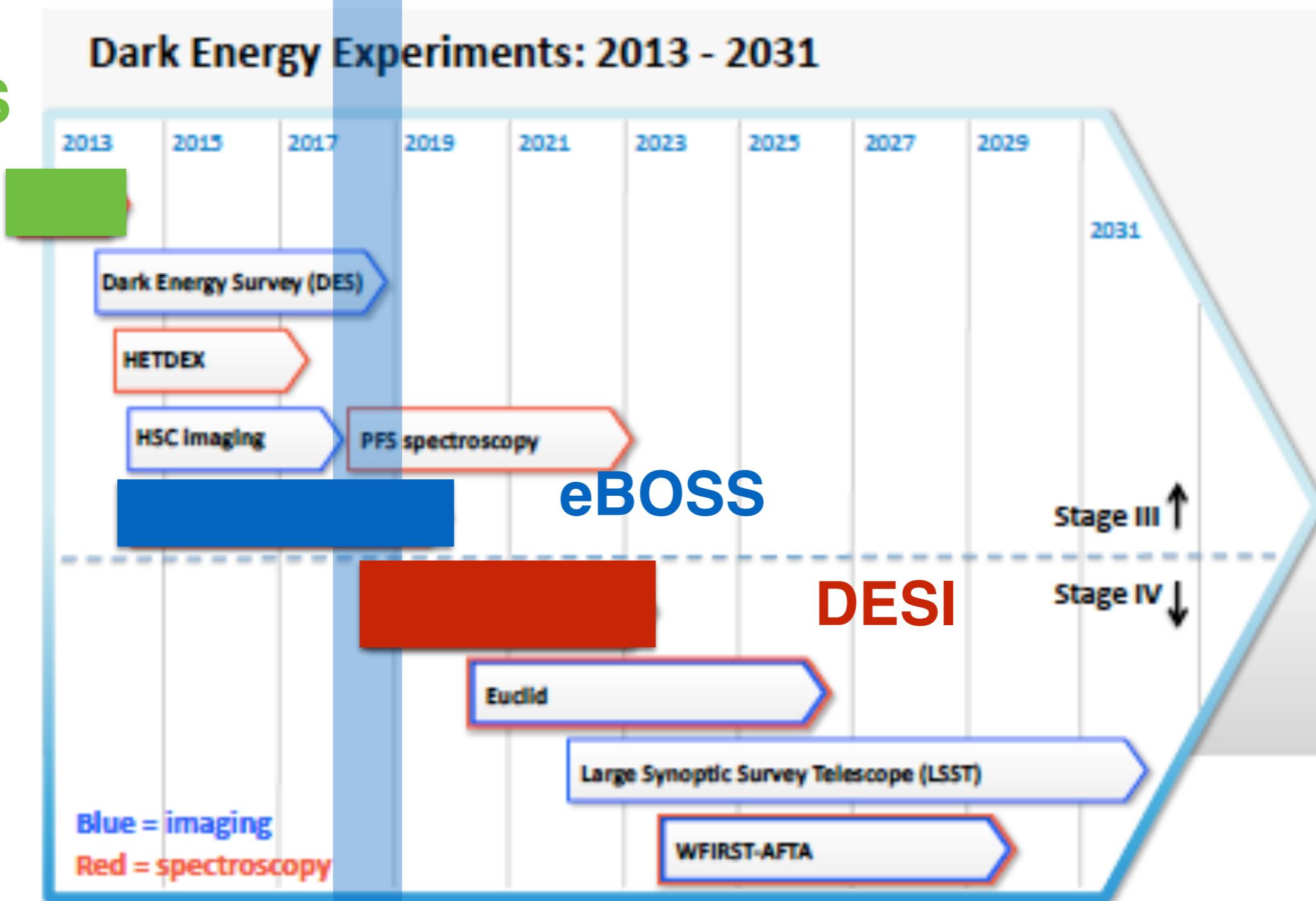
Extended Baryonic Oscillations Spectroscopic Survey.



Dark Energy Spectroscopic Instrument.

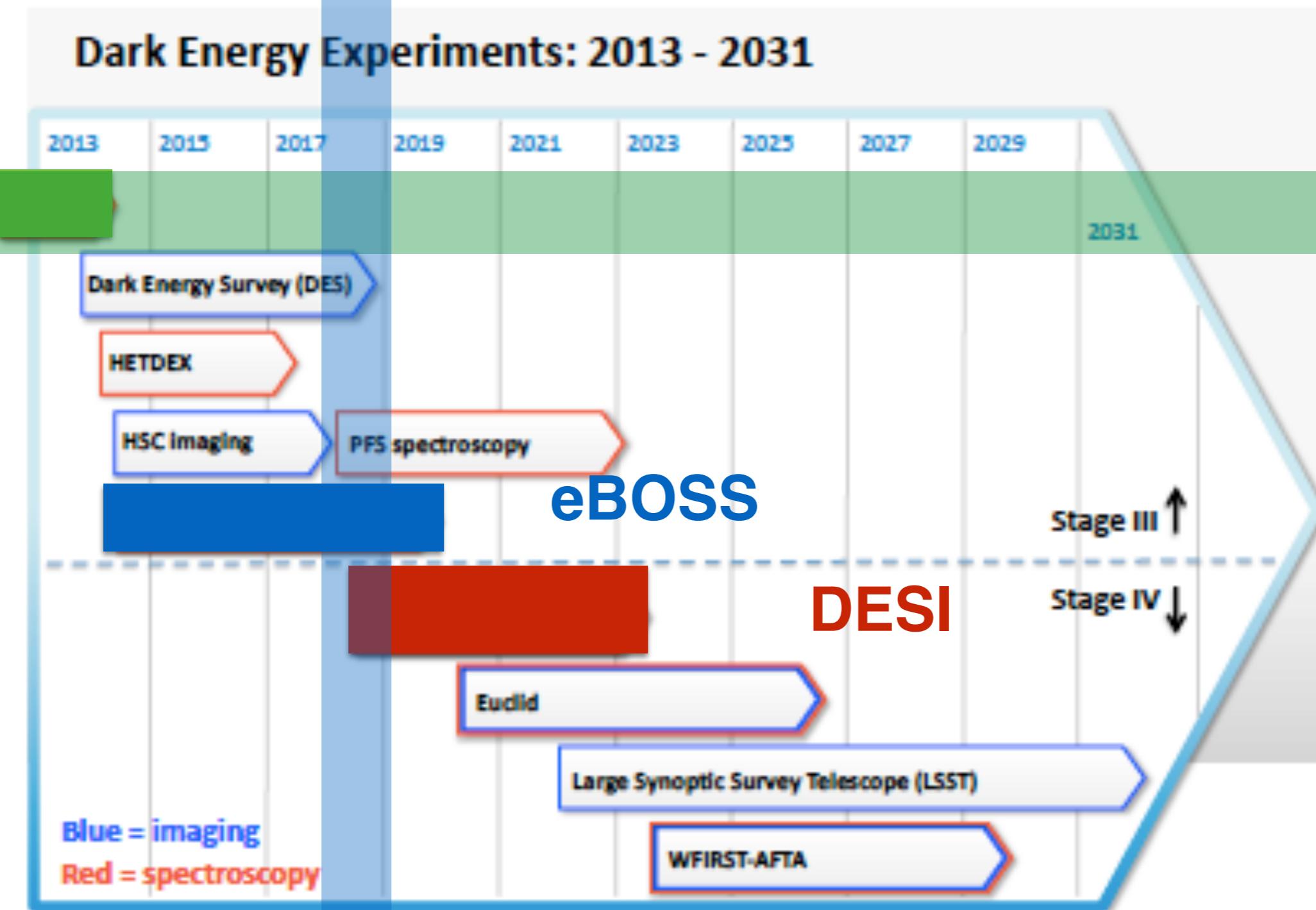
Dark Energy Experiments

BOSS



Dark Energy Experiments

BOSS





Baryonic Oscillations Spectroscopic Survey

2008-2014

Completed !

Scientific Goal(s):

- Dark Energy

Key Observables:

- BAO (RSD)

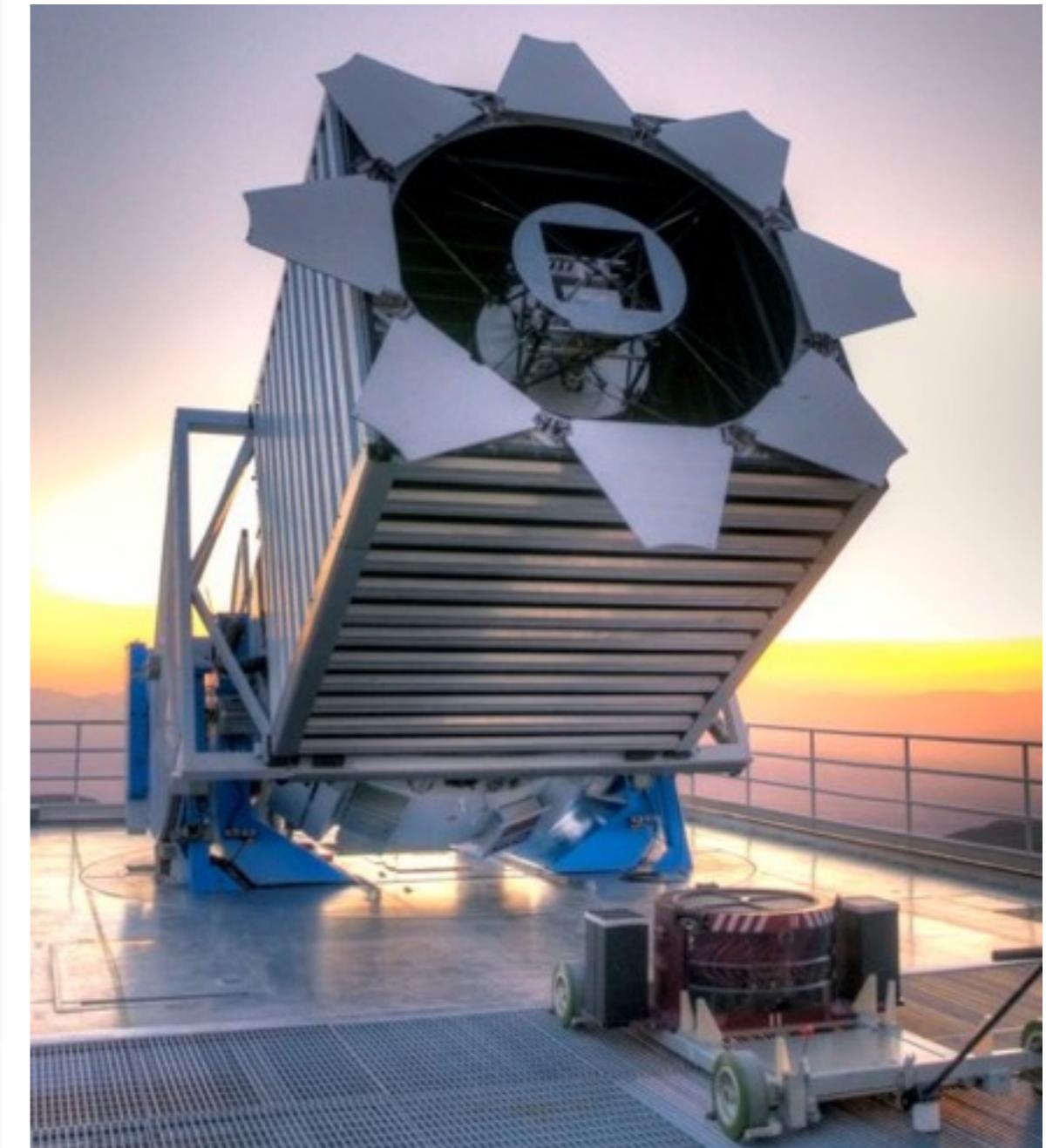
Precision:

- LRG 1% at $z=0.6$
- LyAQSO 1.5% at $z=2.3$

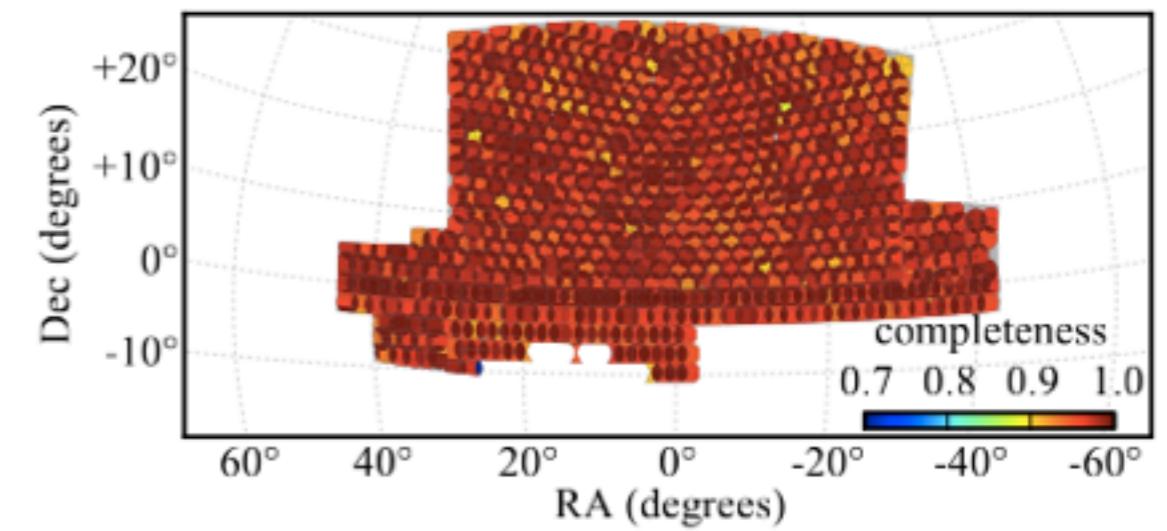
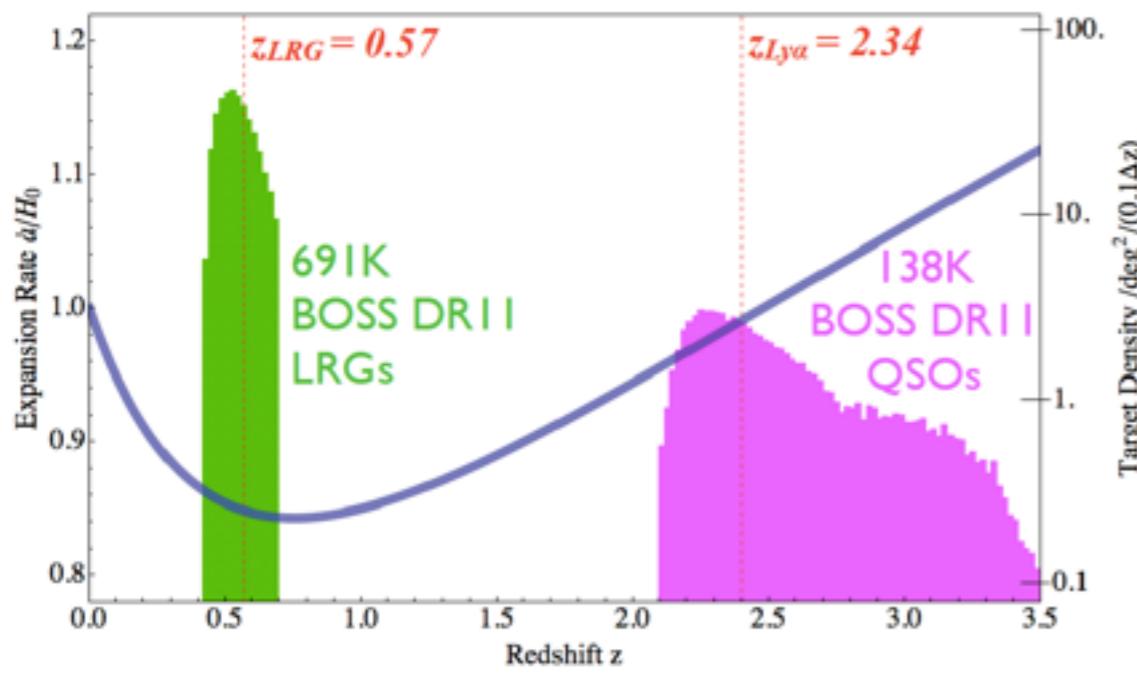
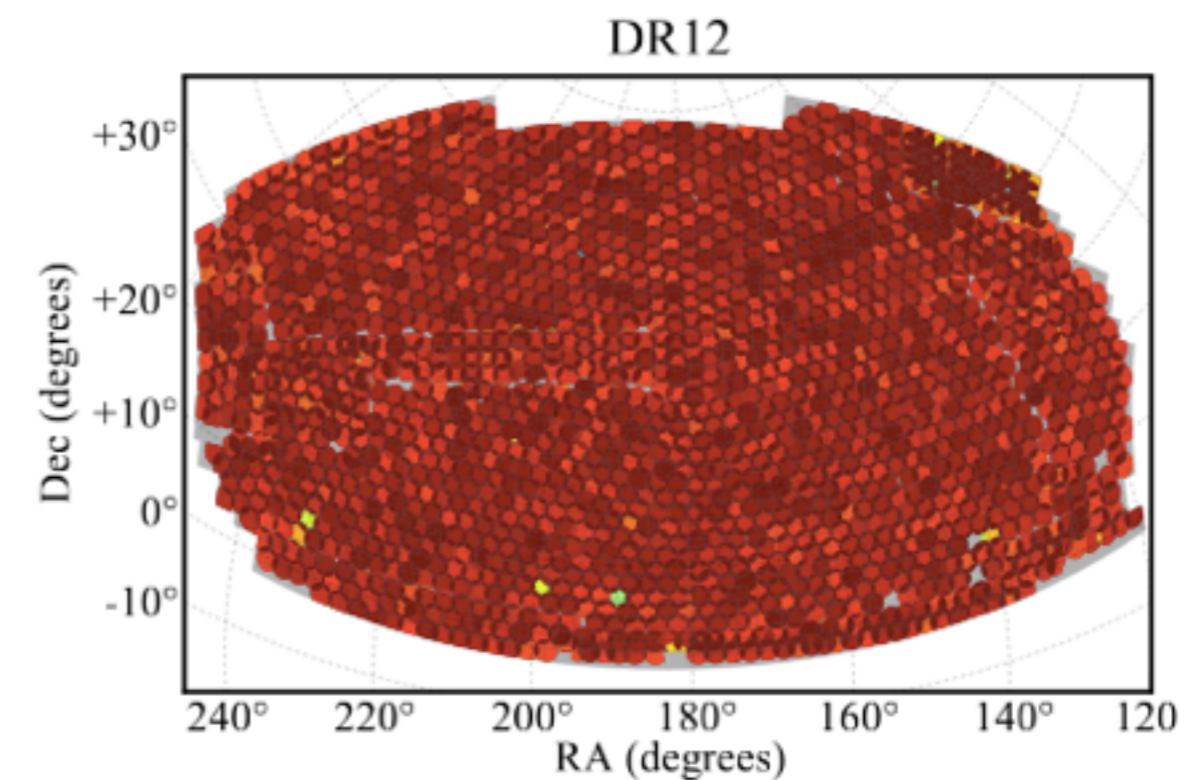
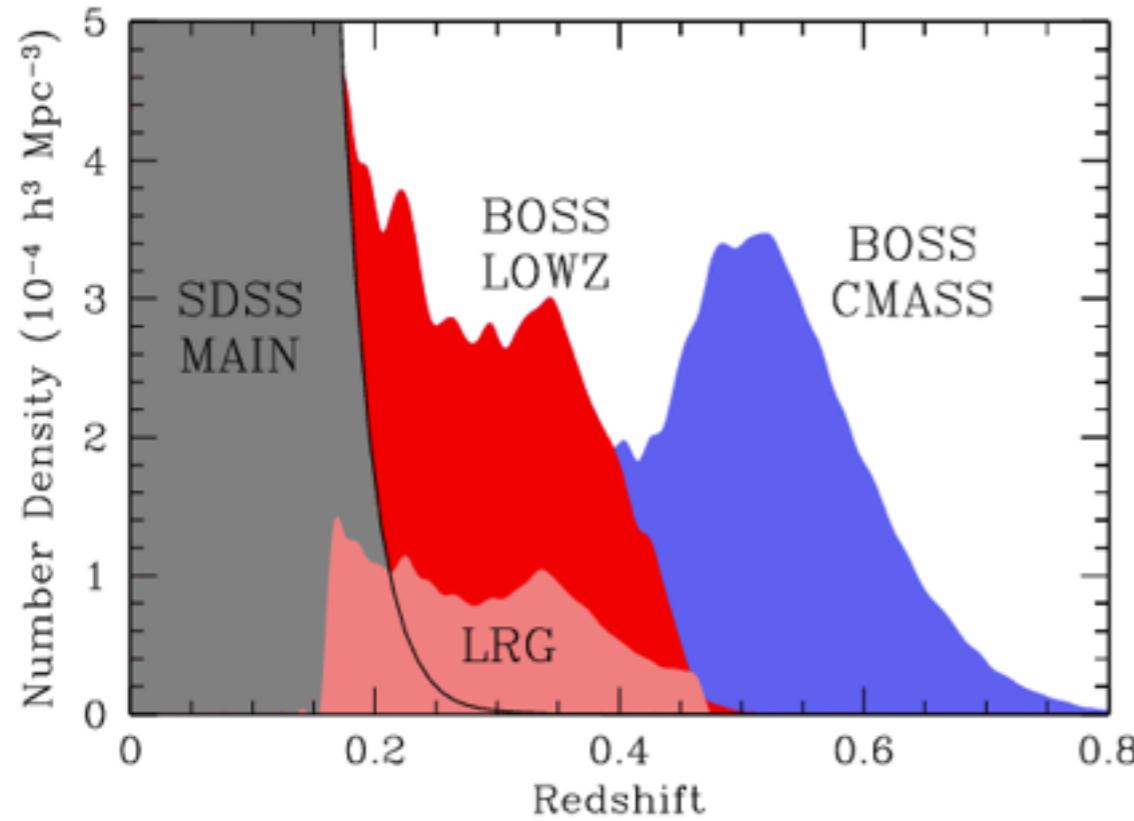
Redshift range :

- $0.32 < z < 0.71$

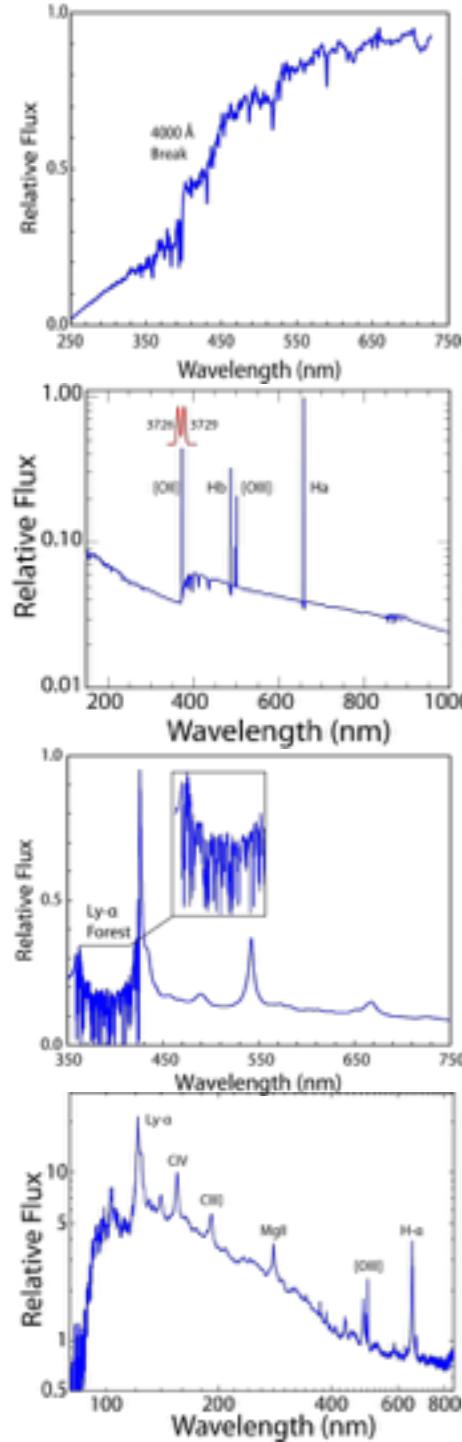
Tracers: LRG y LyAQSO



Galaxy/Quasar Samples



Tracers



LRG

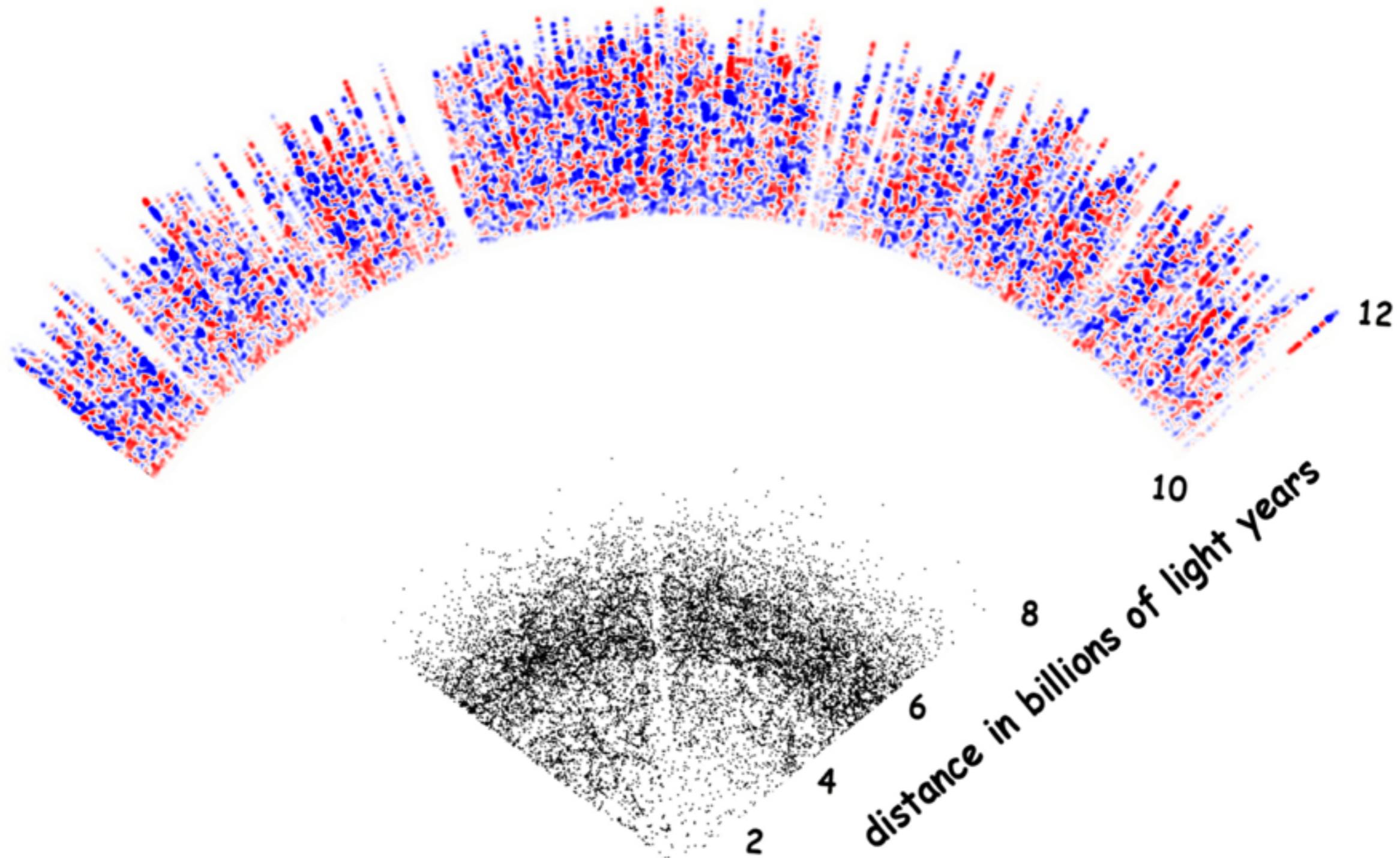
1.5 Millions

ELG

150, 000

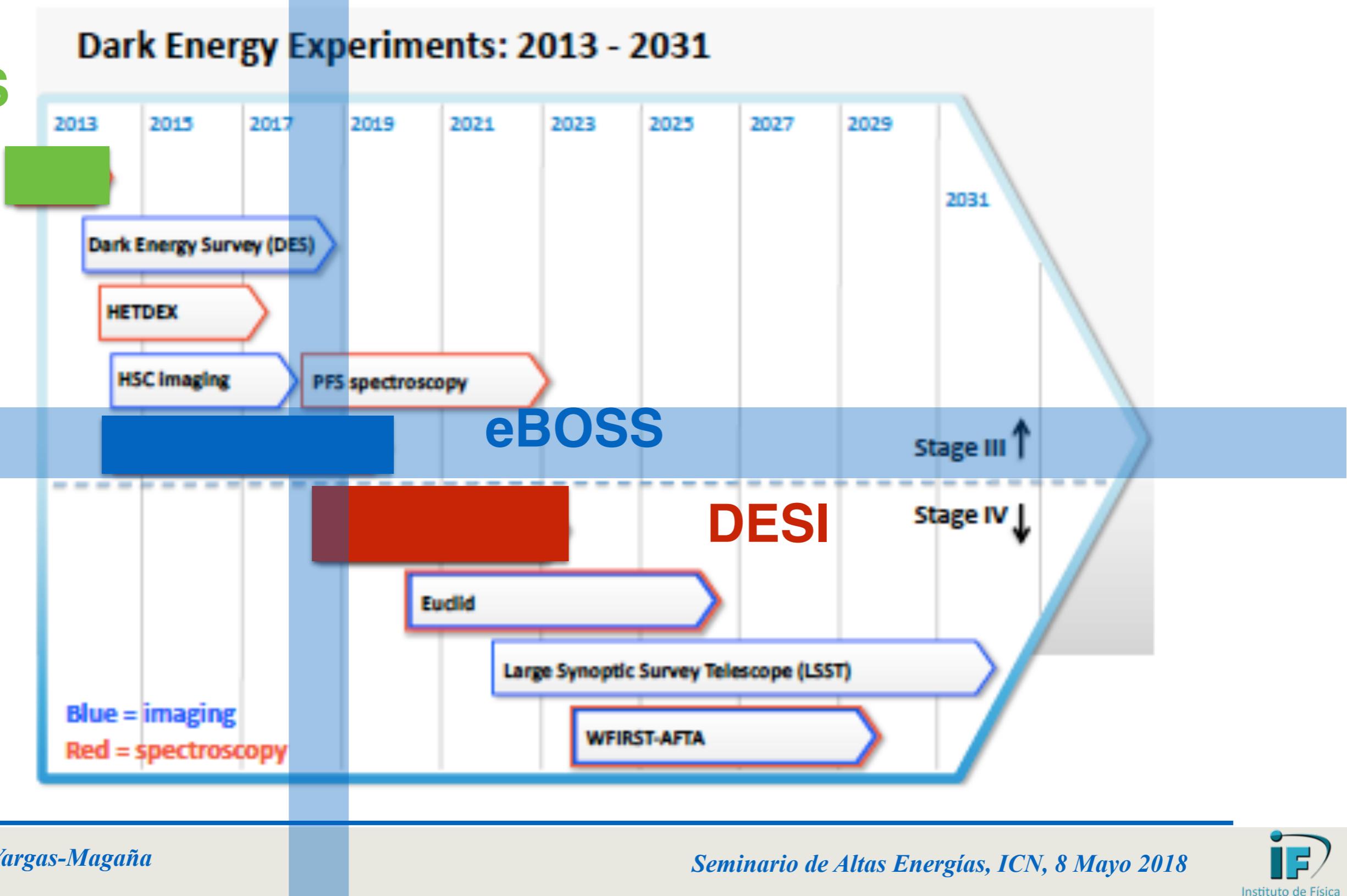
LyA-QSO

QSO



Dark Energy Experiments

BOSS





extended Baryonic Oscillations Spectroscopic Survey

2014-2019

Ongoing !

Scientific Goal(s):

- Dark Energy

Key Observables:

- BAO , RSD

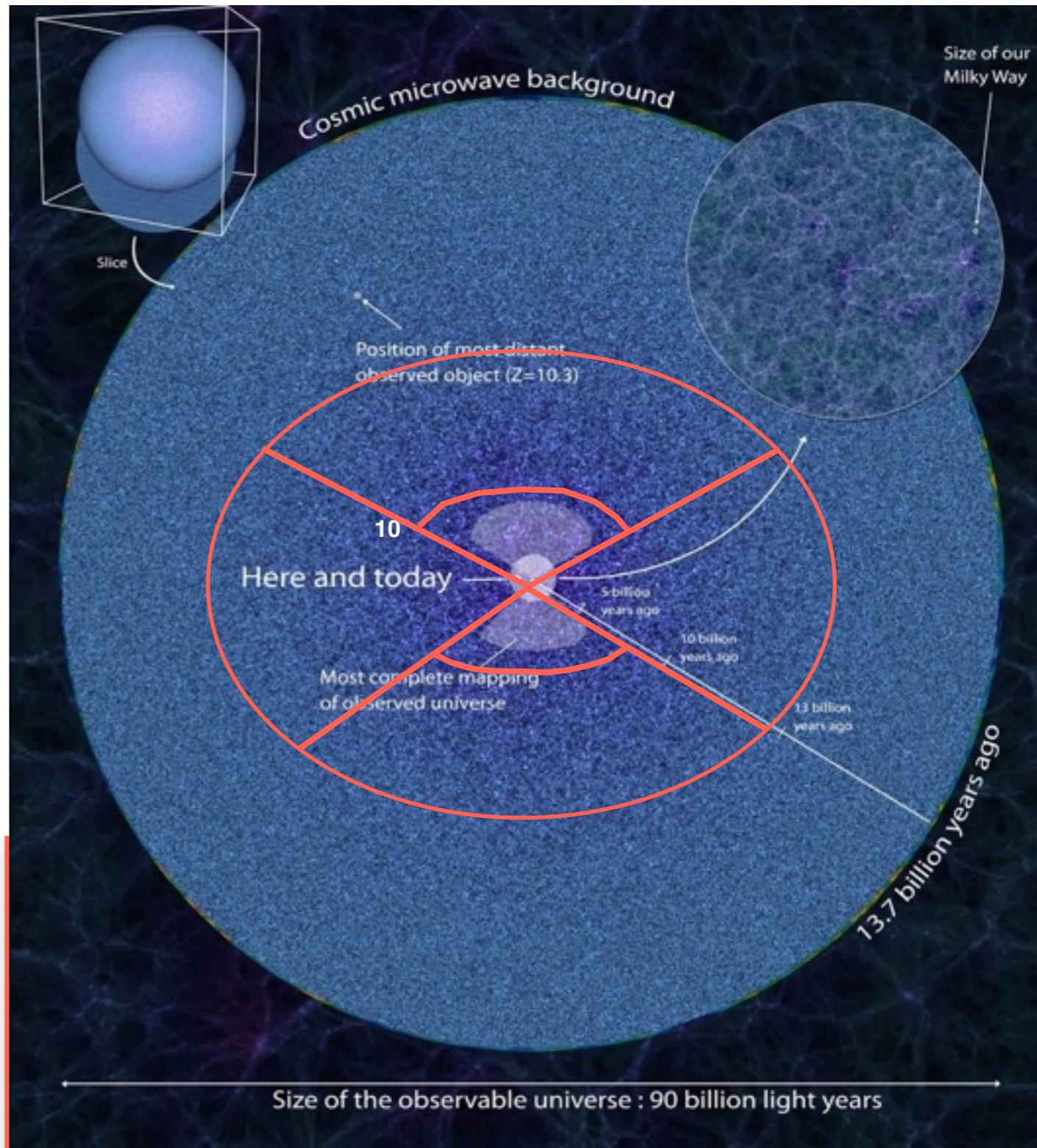
Precision:

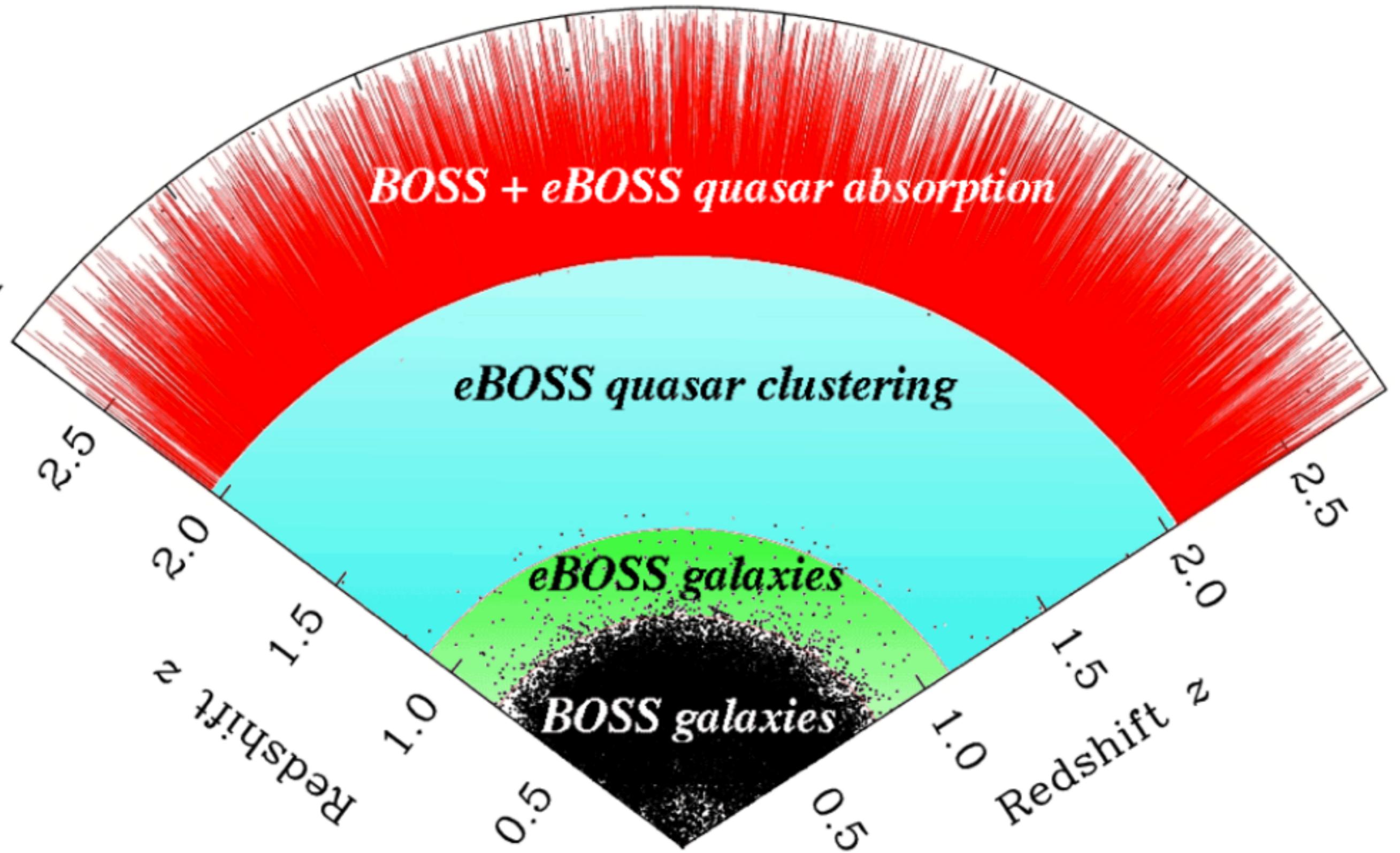
- LRG's DA(z) 1.2% and H(z) to 2.1%
- ELG's DA(z) 3.1% and H(z) to 4.7%.
- QSO DA(z) 2.8% and H(z) to 4.2%.
- Ly α forest dA(z) and H(z) at $z > 2.1$ by a factor of 1.44 relative to BOSS.

Redshift range :

- $0.32 < z < 0.71$

Tracers: LRG,ELG,QSO,LyQSO







This is Data Release 15.

Data Surveys Instruments Collaboration Results Education The Future Contact

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Search

APOGEE-1

APOGEE-2

BOSS

eBOSS

MaNGA

MARVELS

SEGUE

eBOSS

The Extended Baryon Oscillation Spectroscopic Survey (eBOSS)

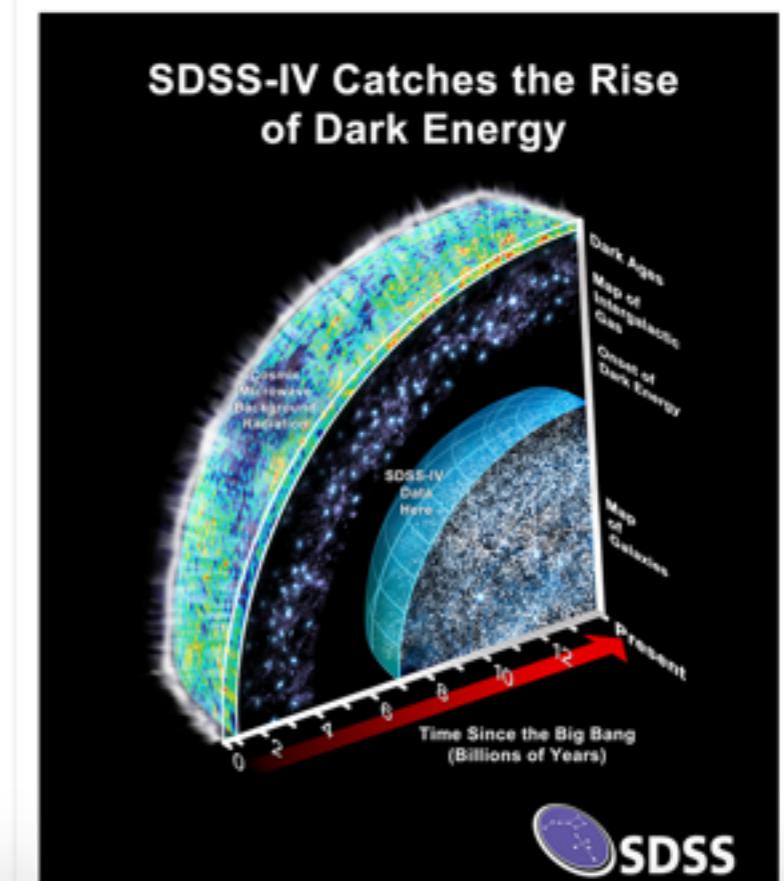
eBOSS will precisely measure the expansion history of the Universe throughout eighty percent of cosmic history, back to when the Universe was less than three billion years old, and improve constraints on the nature of dark energy. "Dark energy" refers to the observed phenomenon that the expansion of the Universe is currently accelerating, which is one of the most mysterious experimental results in modern physics.

eBOSS concentrates its efforts on the observation of galaxies and in particular quasars, in a range of distances (redshifts) currently left completely unexplored by other three-dimensional maps of large-scale structure in the Universe. In filling this gap, eBOSS will create the largest volume survey of the Universe to date. The figure to the right shows the region that will be newly mapped by the eBOSS project. This region corresponds to the epoch when the Universe was transitioning from deceleration due to the effects of gravity, to the current epoch of acceleration.

The combination of eBOSS with the [SPIDERS](#) X-ray selected sample of quasars, and the [TDSS](#) variability selected AGN sample, will create a unique window into the full population of quasars at all epochs to redshift $z = 3$.

Key Science Questions

★ How does the transition from deceleration to acceleration occur? Is



https://www.sdss.org/dr15/data_access/value-added-catalogs/?vac_id=eboss-large-scale-structure-lrg-catalogs-dr14

Index of /sas/dr14/eboss/lss/catalogs/

File Name ↓	File Size ↓	Date ↓
Parent directory/	-	-
data_DR14_LRG_N.fits	17879040	14-Jun-2018 09:17
data_DR14_LRG_S.fits	13728960	14-Jun-2018 09:17
data_DR14_QSO_N.fits	48631680	22-Mar-2018 06:37
data_DR14_QSO_S.fits	32437440	22-Mar-2018 06:37
eboss_lss_catalogs.sha1sum	1012	31-Jul-2018 18:10
mask_DR14_LRG_N.fits	5901120	14-Jun-2018 09:17
mask_DR14_LRG_N.ply	3995230	14-Jun-2018 09:17
mask_DR14_LRG_S.fits	5901120	14-Jun-2018 09:17
mask_DR14_LRG_S.ply	3973121	14-Jun-2018 09:17
mask_DR14_QSO_N.fits	5806080	22-Mar-2018 06:38
mask_DR14_QSO_N.ply	6489448	22-Mar-2018 06:38
mask_DR14_QSO_S.fits	5806080	22-Mar-2018 06:38
mask_DR14_QSO_S.ply	6489448	22-Mar-2018 06:38
random_DR14_LRG_N.fits	120536640	14-Jun-2018 09:17
random_DR14_LRG_S.fits	87384960	14-Jun-2018 09:17
random_DR14_QSO_N.fits	616227840	22-Mar-2018 06:37
random_DR14_QSO_S.fits	395066880	22-Mar-2018 06:37

SDSS-IV Science Archive Server (SAS)

Data model: galaxy_DRX_SAMPLE_NS

General description: These files contain the Large Scale Structure galaxy redshift catalogs, which become available after publication.

Naming convention: galaxy_DRXvY_SAMPLE_NS.fits.gz - DRXvY (vY is the internal version number, used by the galaxy clustering working group) is the data release, SAMPLE is either CMASS or LOWZ, NS is one of (North,South). There is a corresponding mangle mask file mask_DRXvY_SAMPLE_NS.ply/fits to describe the sky coverage for each sample.

In DR12 sample classes LOWZE2, LOWZE3, CMASSLOWZ, CMASSLOWZE2, CMASSLOWZE3, and CMASSLOWZTOT were added. LOWZE2 and LOWZE3 correspond to early targeting algorithms for LOWZ-like galaxies. We also generate sample catalogs that combine CMASS and LOWZ, LOWZE2, or LOWZE3 into a single sample. CMASSLOWZTOT combines CMASSLOWZE2, CMASSLOWZE3, and CMASSLOWZ catalogs, using each only in the region where they were targeted.

By default catalogs containing LOWZE2 or LOWZE3 selection also include chunks 7 and higher, even though targeting was the final LOWZ algorithm for those higher chunks. File names are appended with '_trimmed' if the catalog has been trimmed to its original target footprint (chunk 2 for LOWZE2, chunks 3 through 6 for LOWZE3).

Approximate size: 15-300 Mbytes

File type: FITS (gzipped)

Written by products: Galaxy clustering working group large scale structure code (mksample).

Column names:

- **ra** (float64): Right Ascension
- **dec** (float64): Declination
- **run** (int32): run number (see the [photoObj](#) description)
- **rerun** (int32): rerun number (see the [photoObj](#) description)
- **camcol** (int32): camera column (see the [photoObj](#) description)
- **field** (int32): field number (see the [photoObj](#) description)
- **id** (int32): object ID within the field (see the [photoObj](#) description)
- **ichunk** (int32): chunk id which tells you the chunk number that the object is from. Chunks below 15 were targeted using earlier versions of photometry and/or targeting code.
- **tchunk** (int32): targeting chunk id (for example, chunk 2 objects are targeted using tchunk=8 (main008) targeting file. Deprecated in DR12.

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eBOSS large-scale structure LRG catalogs (DR14)

Julian E. Bautista, Mariana Vargas-Magaña, Kyle S. Dawson, Will J. Percival, Jonathan

GALAXY **eBOSS** **DR14**

Brinkmann, Joel Brownstein, Benjamin Camacho, Johan Comparat, Hector Gil-Marín, Eva-Maria Mueller, Jeffrey A.

Newman, Abhishek Prakash, Ashley J. Ross, Donald P. Schneider, Hee-Jong Seo, Jeremy Tinker, Rita Tojeiro, Zhongzu Zhai, Gong-Bo Zhao

[Overview](#)[Tools](#)**Value Added Catalogs**[SDSS Supernovae](#)[Bulk Downloads](#)[Data Volume](#)[System Status](#)

Type: Scientific Analysis Catalog

🔗 Location on SAS: <https://data.sdss.org/sas/dr14/eboss/lss/catalogs>

🔗 DATAMODEL: https://data.sdss.org/datamodel/files/BOSS_LSS_REDUX

VAC Filters

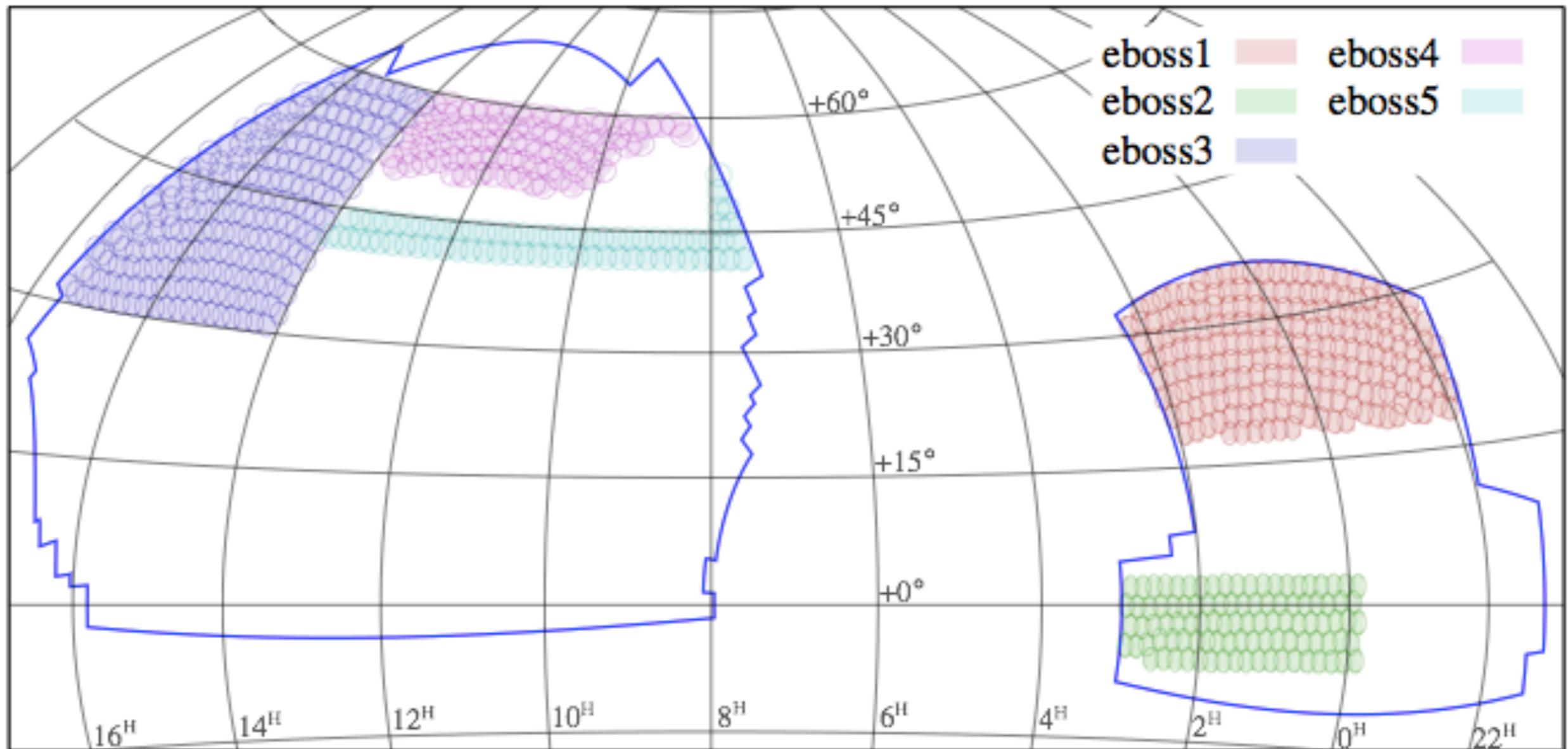
This VAC is described in full on [this web page](#).

This VAC contains the eBOSS large-scale structure catalogues for DR14 luminous red galaxies (LRGs), and consists of the data and randoms catalogues that underpin the cosmological analyses from the eBOSS team. These catalogues contain all the data and necessary information (window function, systematic quantities, completeness estimates and corrections for close-pairs and redshift failures) to reproduce the team's clustering measurements. The procedure to create this catalog is mostly based on [Reid et al. \(2016\)](#) with modifications to the redshift failure and systematics corrections described in [Bautista et al. \(2018\)](#).



Current status of eBOSS

K.Dawson et al 2015, eBOSS arXiv:1508.04473





Predictions for eBOSS

Table 9

expected for each eBOSS sample, together with predictions for the effective volumes and fractional const distance measurements and growth of structure.

Sample	Epoch	Area (deg ⁻²)	σ_H/H	σ_{D_A}/D_A	σ_R/R	$\sigma_{f\sigma_8}/f\sigma_8$
LRG	year 2	2790	0.032	0.017	0.012	0.040
	year 4	4185	0.026	0.015	0.010	0.034
	year 6	6975	0.021	0.012	0.008	0.026
ELG (High Density DECam)	year 4	1100	0.047	0.031	0.020	0.038
Quasar	year 2	3000	0.066	0.043	0.028	0.050
	year 4	4500	0.054	0.036	0.023	0.041
	year 6	7500	0.042	0.028	0.018	0.032
BOSS Ly α Quasars		10,400	0.02	0.025	–	–
BOSS + eBOSS	year 2	3000	0.017	0.021	–	–
Ly α Quasars	year 4	4500	0.016	0.020	–	–
	year 6	7500	0.014	0.017	–	–

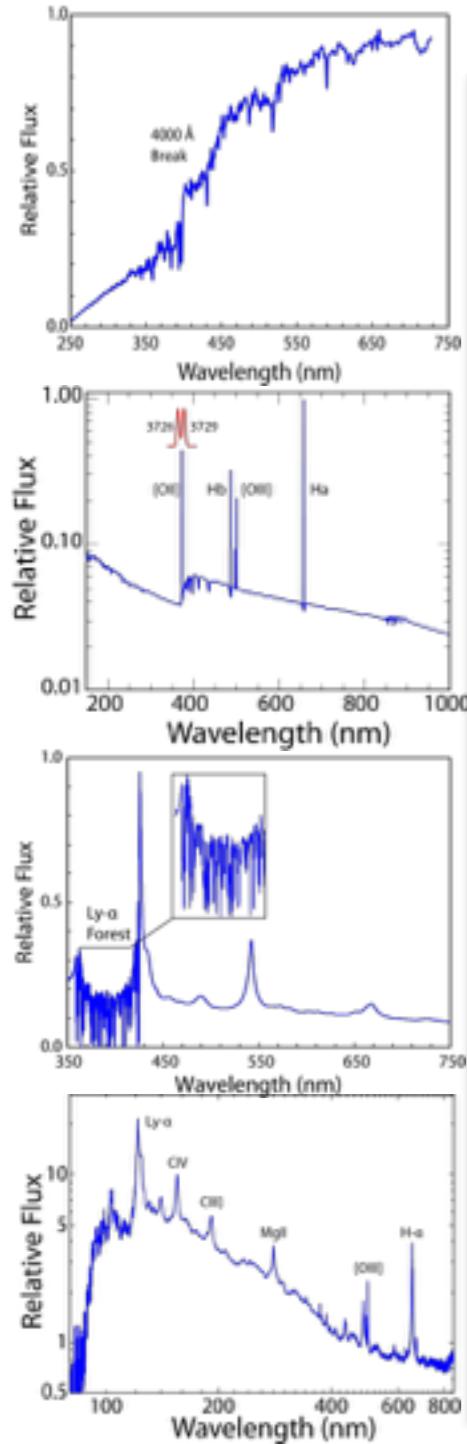
K.Dawson et al 2015, eBOSS arXiv:1508.04473

The third and fourth years will be split evenly between observations of ELG plates and observations of the LRG and quasar plates.

The final two years will be dedicated entirely to the LRG and quasar targets



Tracers



1.5 Millions



250,000
 $0.6 < z < 1.1$

195,000
 $0.6 < z < 1.1$

500,000
 $0.9 < z < 3.5$

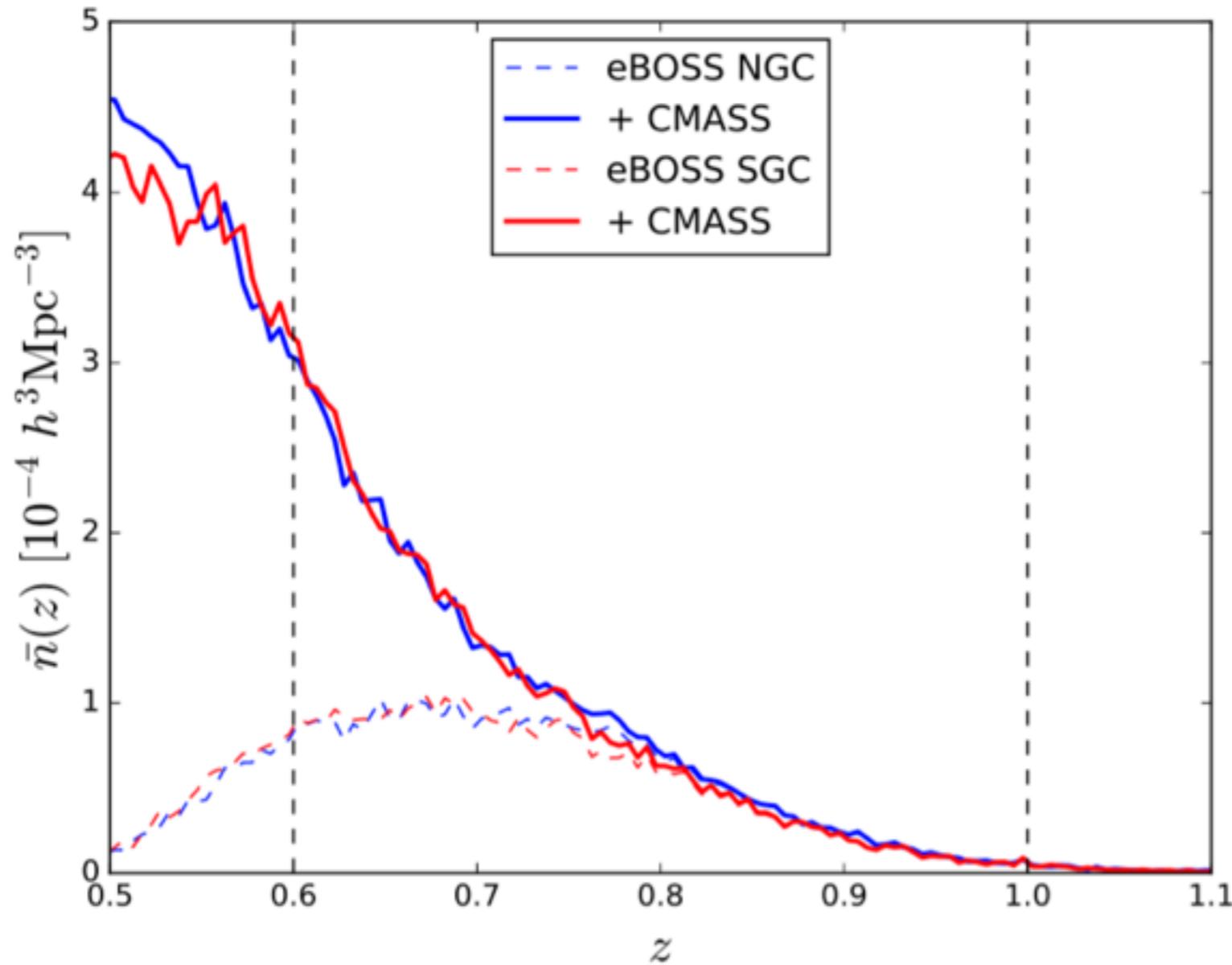


Figure 2. Density of LRGs as a function of redshift. Dashed vertical lines indicate the redshift range used in our clustering measurement. Here we see that a significant fraction of eBOSS LRGs have redshifts below 0.6, where CMASS are more numerous. We can remark on the importance of the CMASS sample between redshifts 0.6 and 0.7.

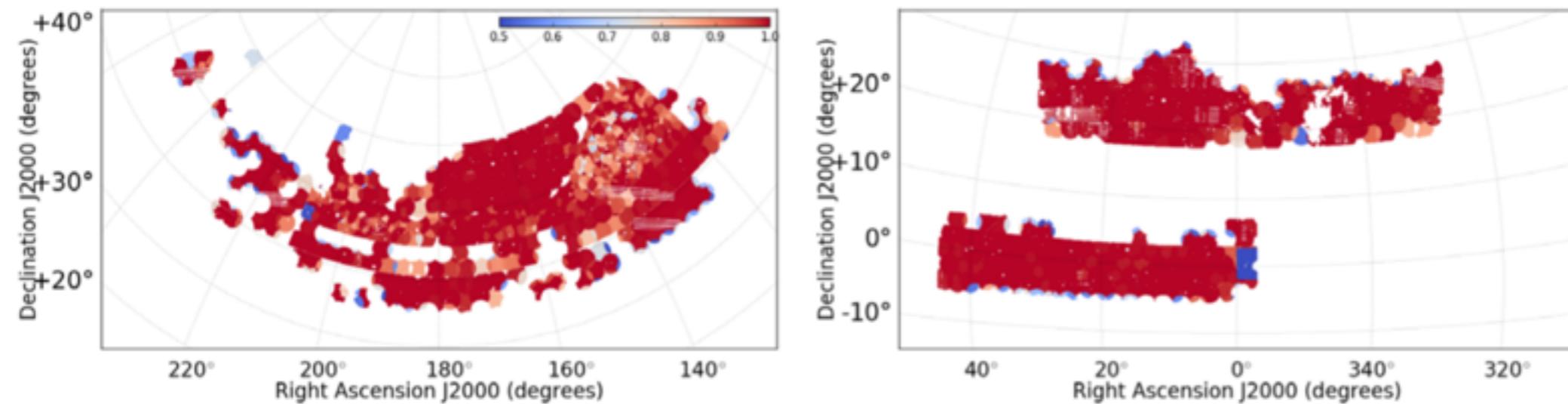


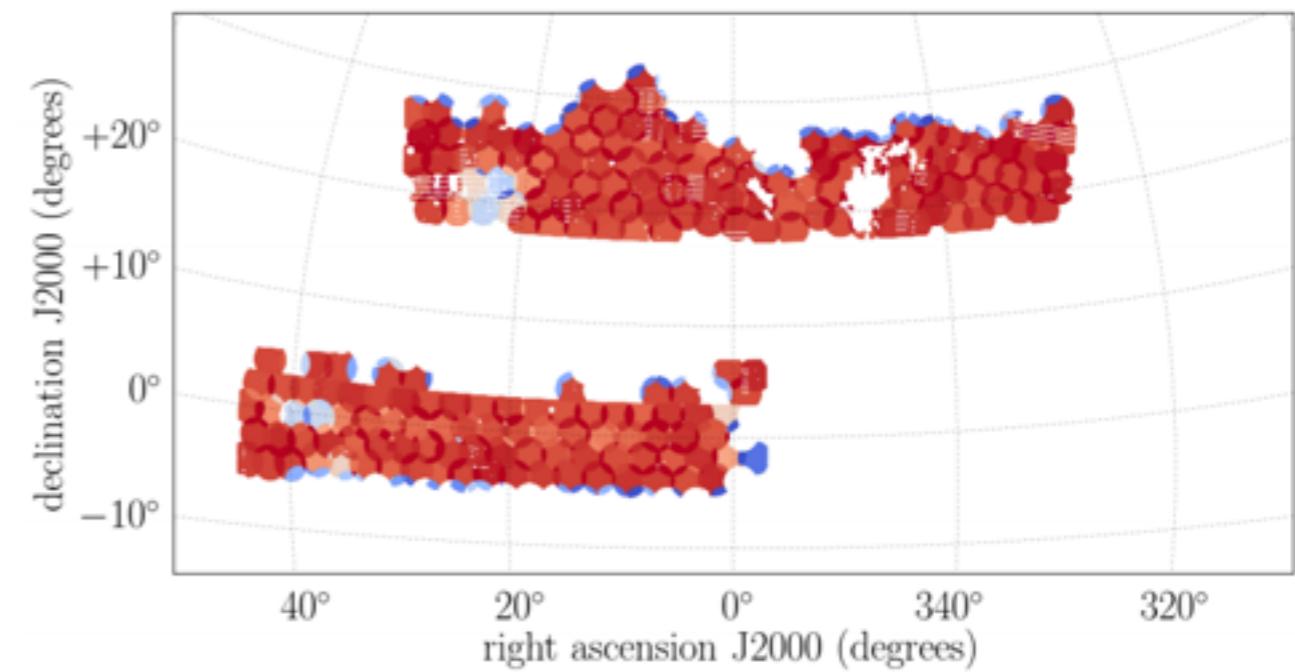
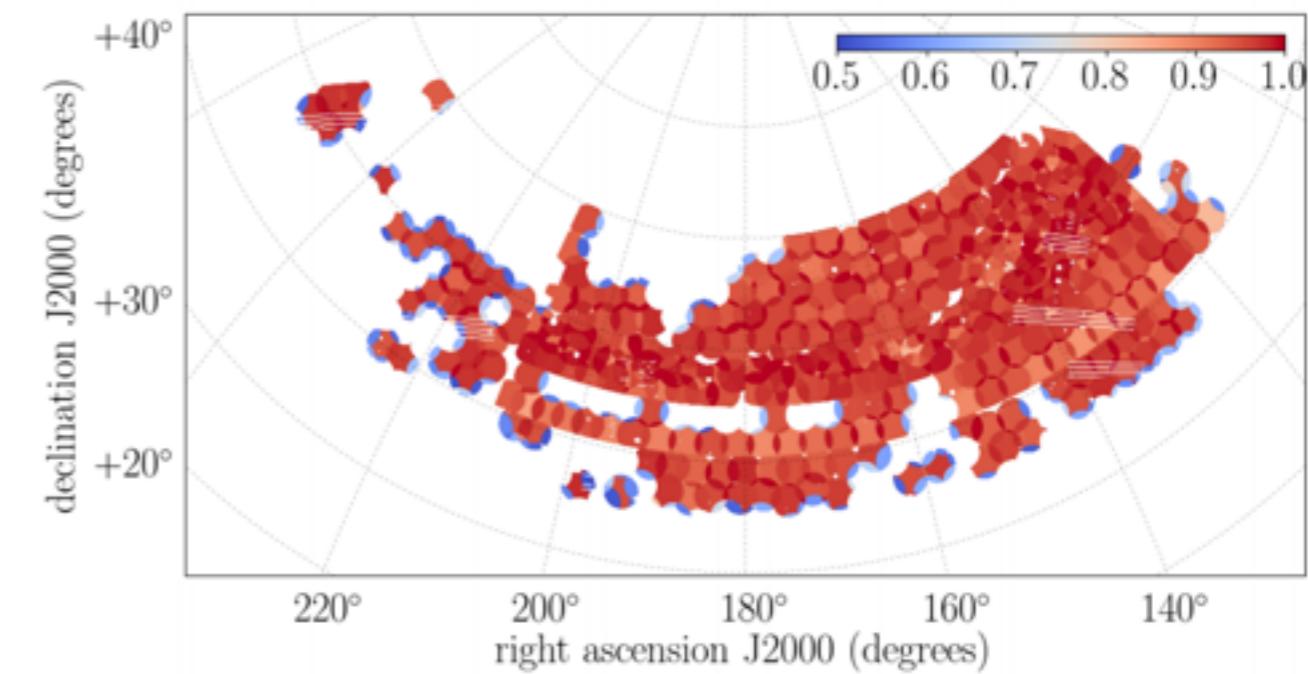
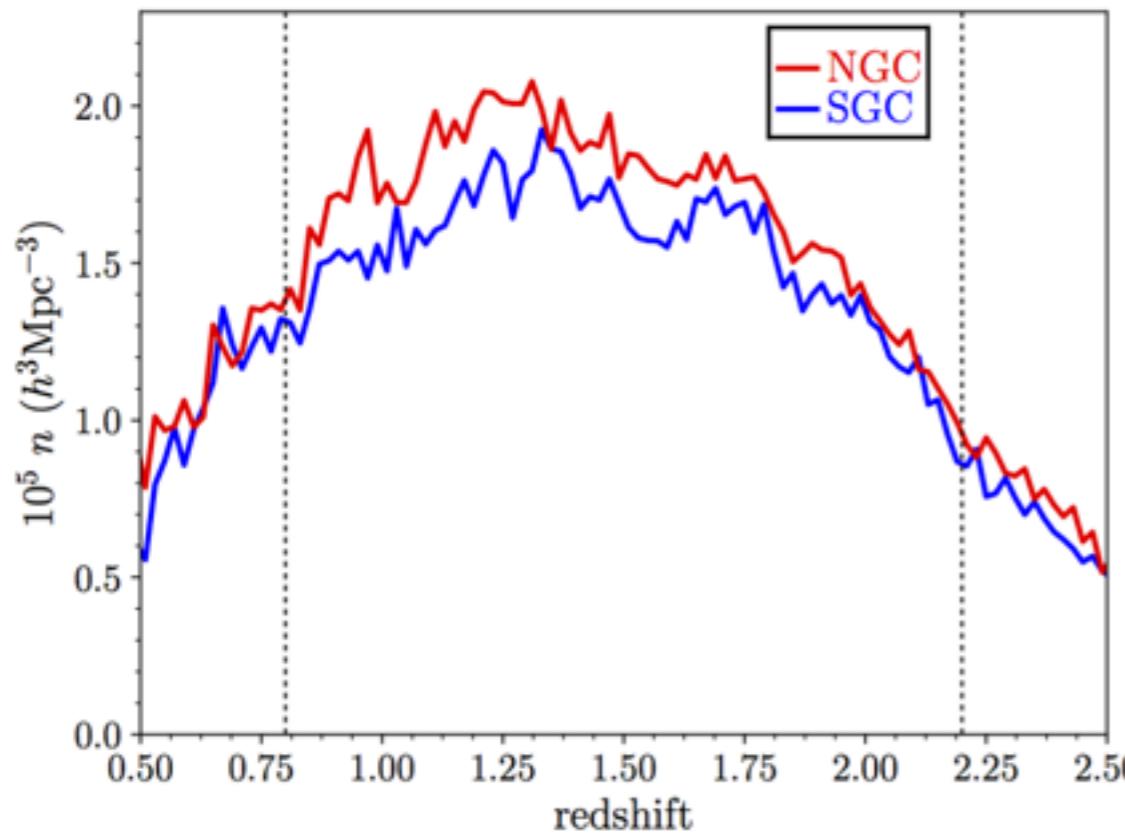
Figure 1. Footprint of the DR14 LRG sample. The colors show the fiber completeness per region for the eBOSS sample only. Regions with fiber completeness below 0.5 were removed from the final sample.



QSO Sample

arxiv:1705.06373

Ata et al 2018



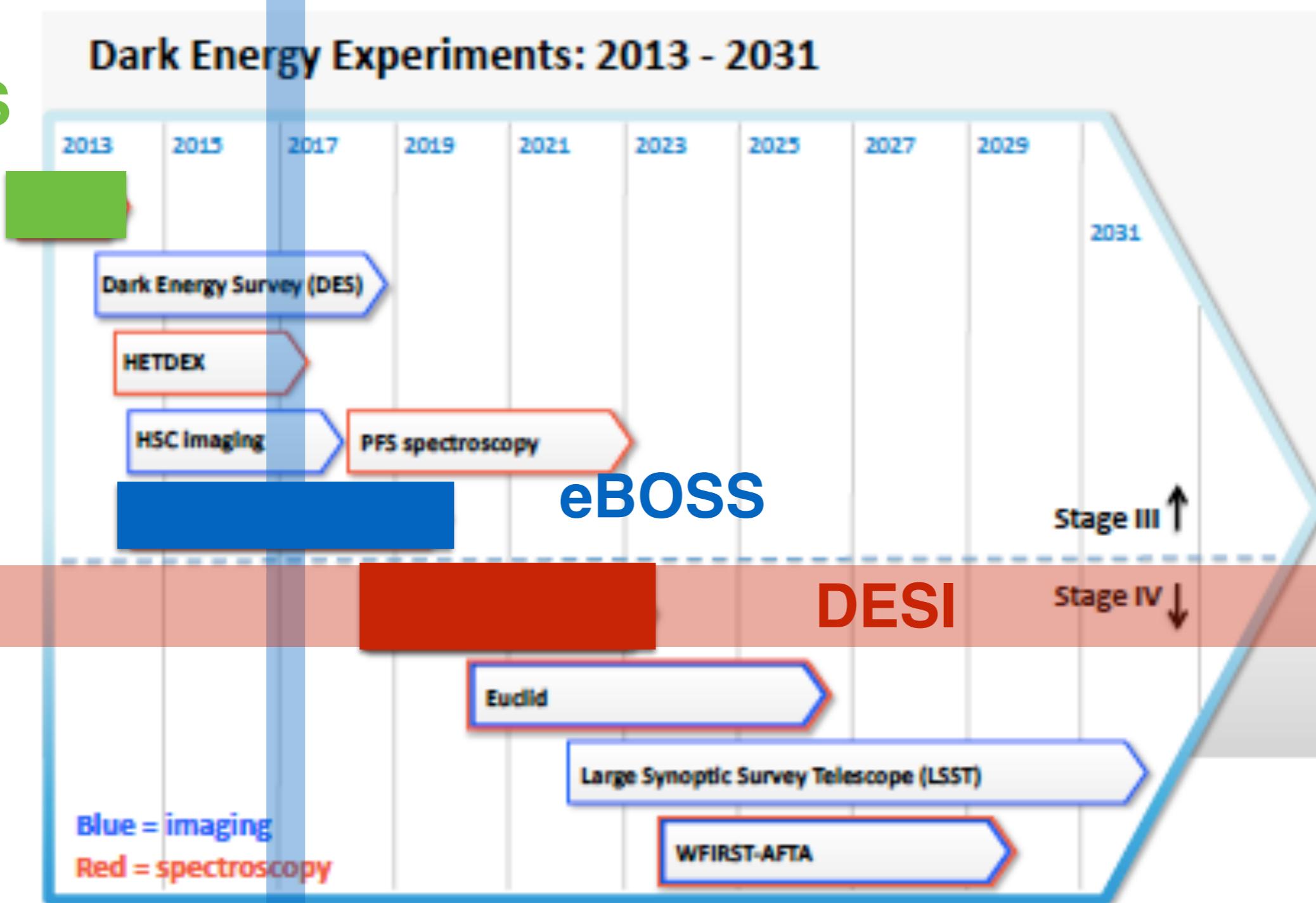
147,000 quasars

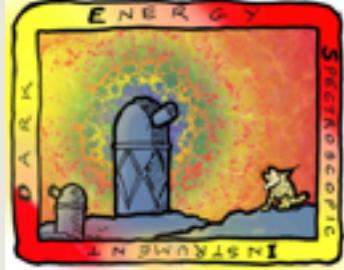
2044 square degrees

with redshifts $0.8 < z < 2.2$

Dark Energy Experiments

BOSS





Dark Energy Spectroscopic Instrument

2020-2025

Scientific Goal(s):

- Dark Energy, (Neutrinos, Early Universe)

Key Observables:

- BAO, RSD

Precision:

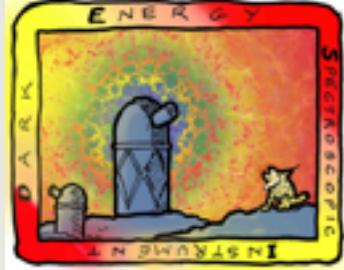
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Redshift range :

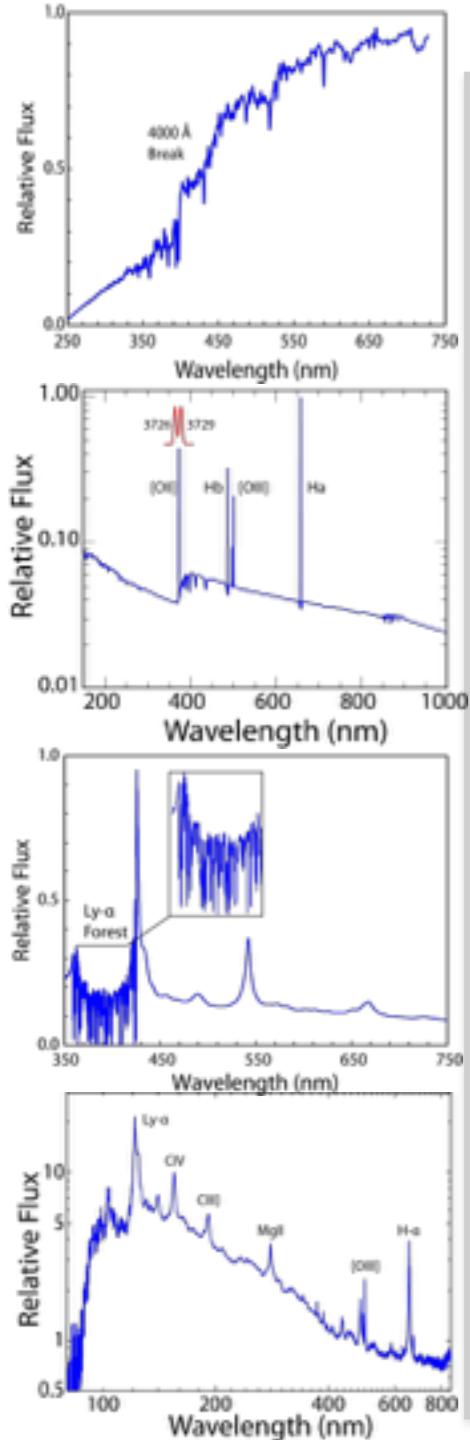
- $0.32 < z < 0.71$

Tracers: LRG,ELG,QSO,LyQSO





Tracers



LRG

1.5 Millions



250,000
 $0.6 < z < 1.1$



4.2 Millions
 $0.4 < z < 1.0$

18 Millions

$0.6 < z < 1.6$

0.7 Millions

$2.1 < z < 3.5$

1.7 Millions

$0.9 < z < 2.1$