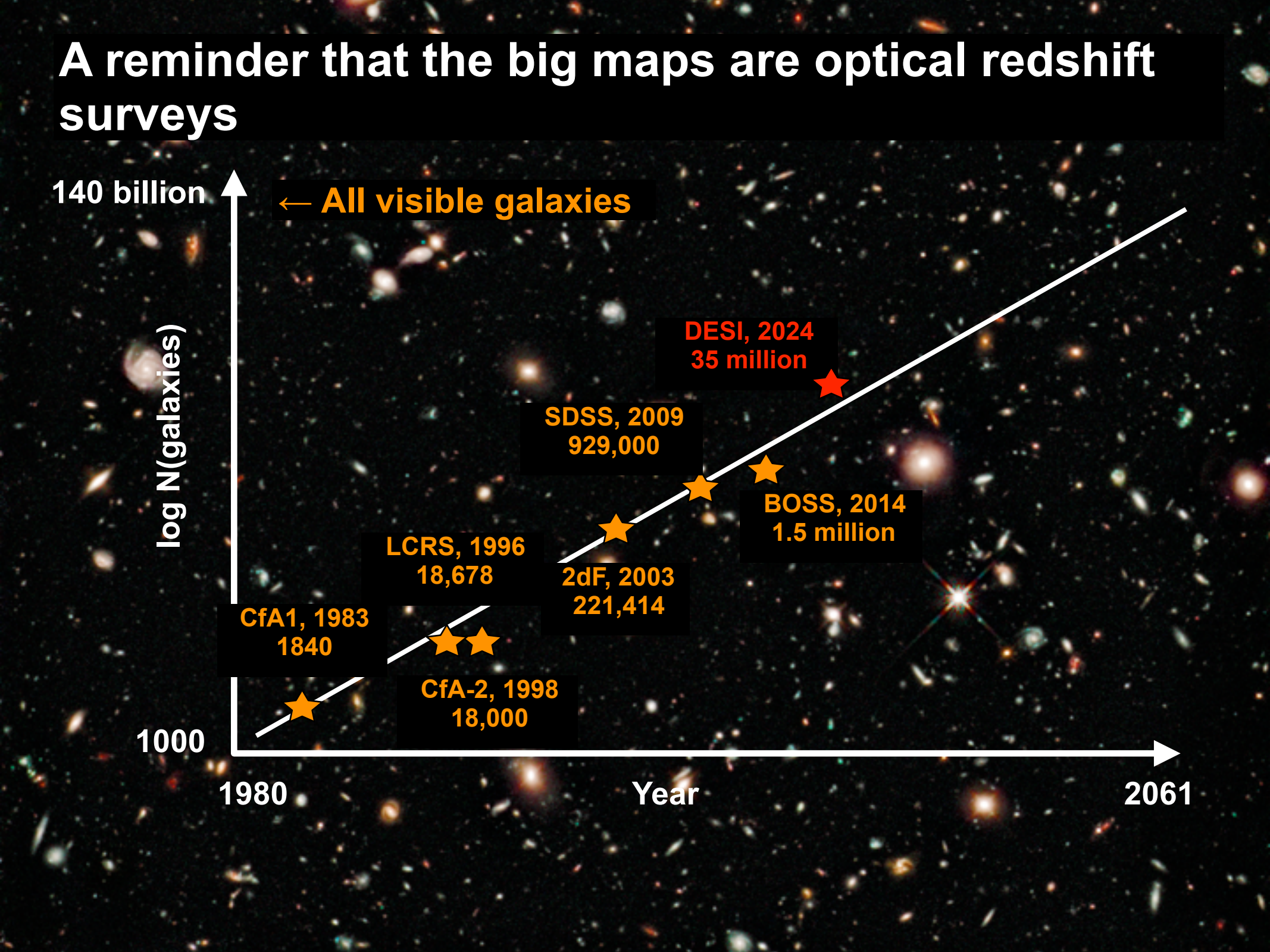
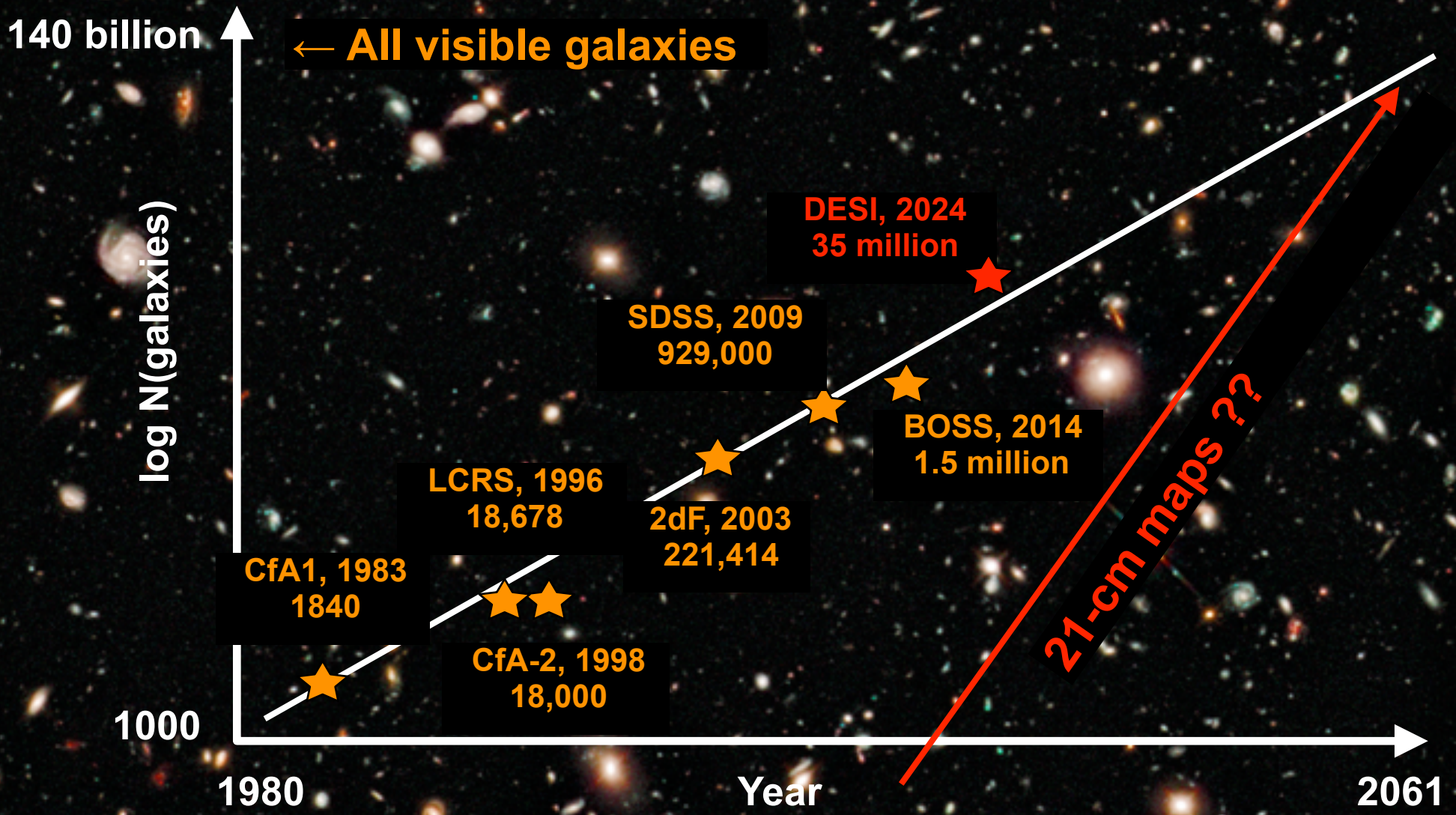
DESI-2

Pat McDonald, David Schlegel
on behalf of the LBNL DESI-2 working group

A reminder that the big maps are optical redshift surveys

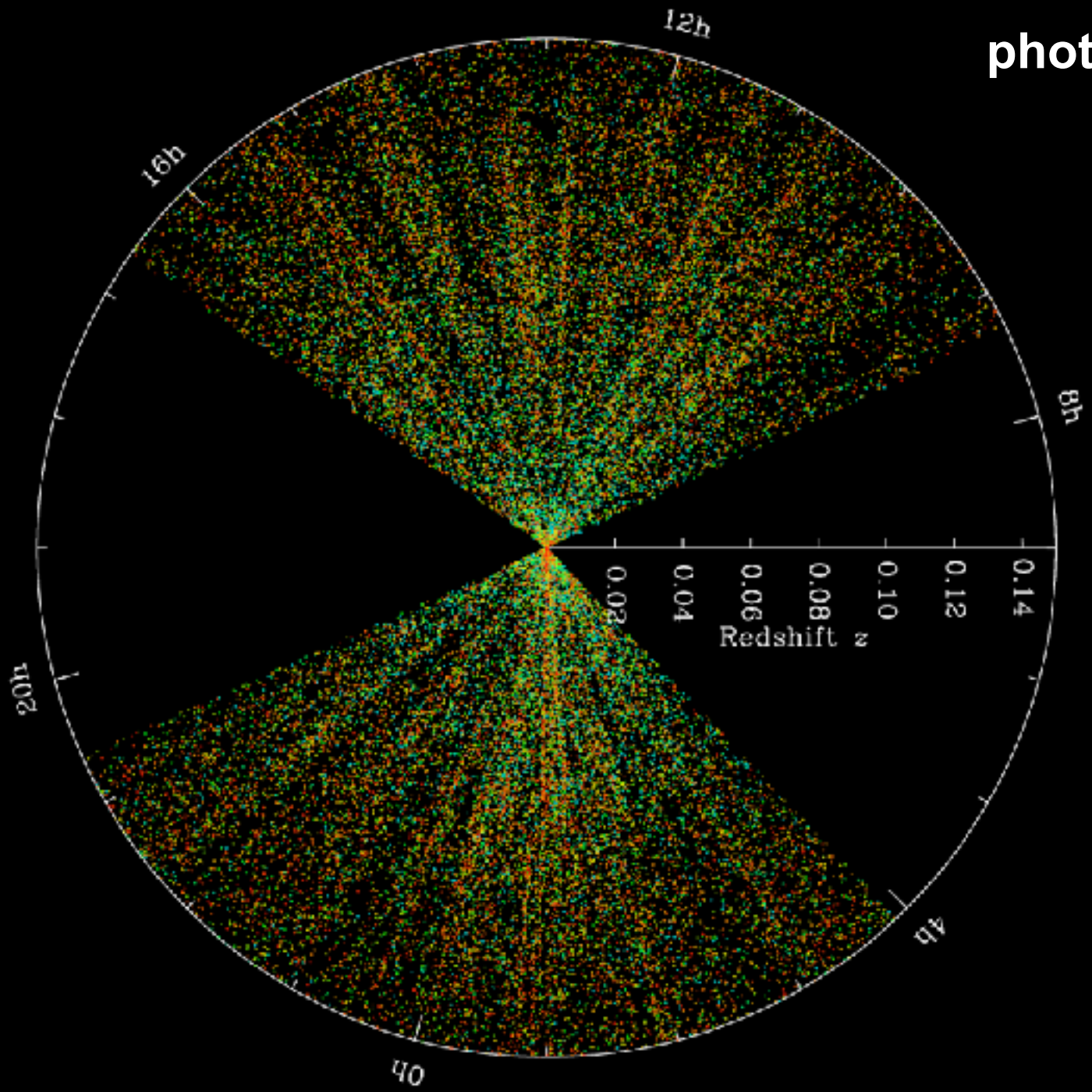


A reminder that the big maps are optical redshift surveys … 21-cm maps need to improve quickly!

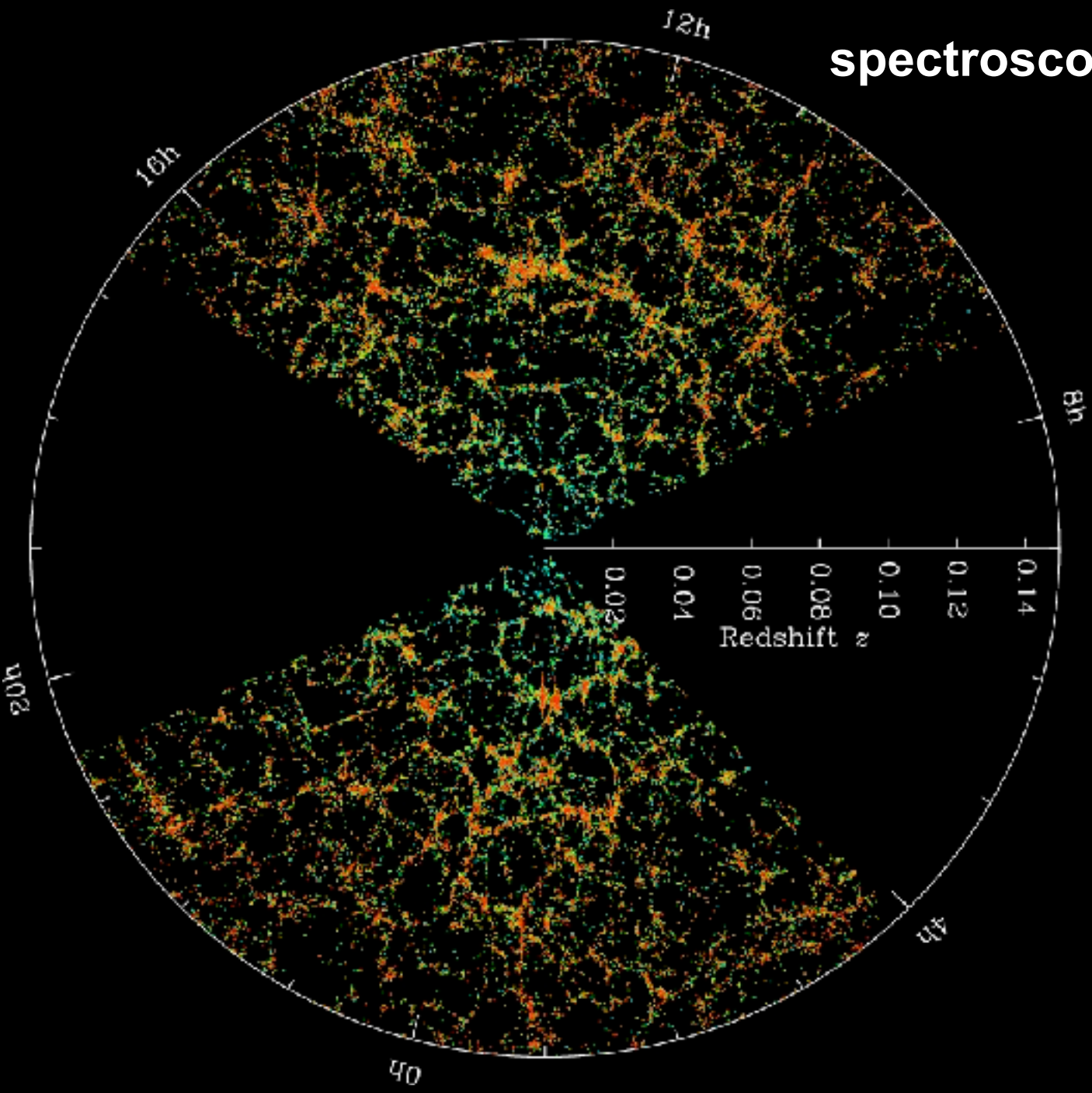


A reminder of why we need spectroscopic maps

photo-z map



A reminder of why we need spectroscopic maps



DESI will be a flexible platform in the future

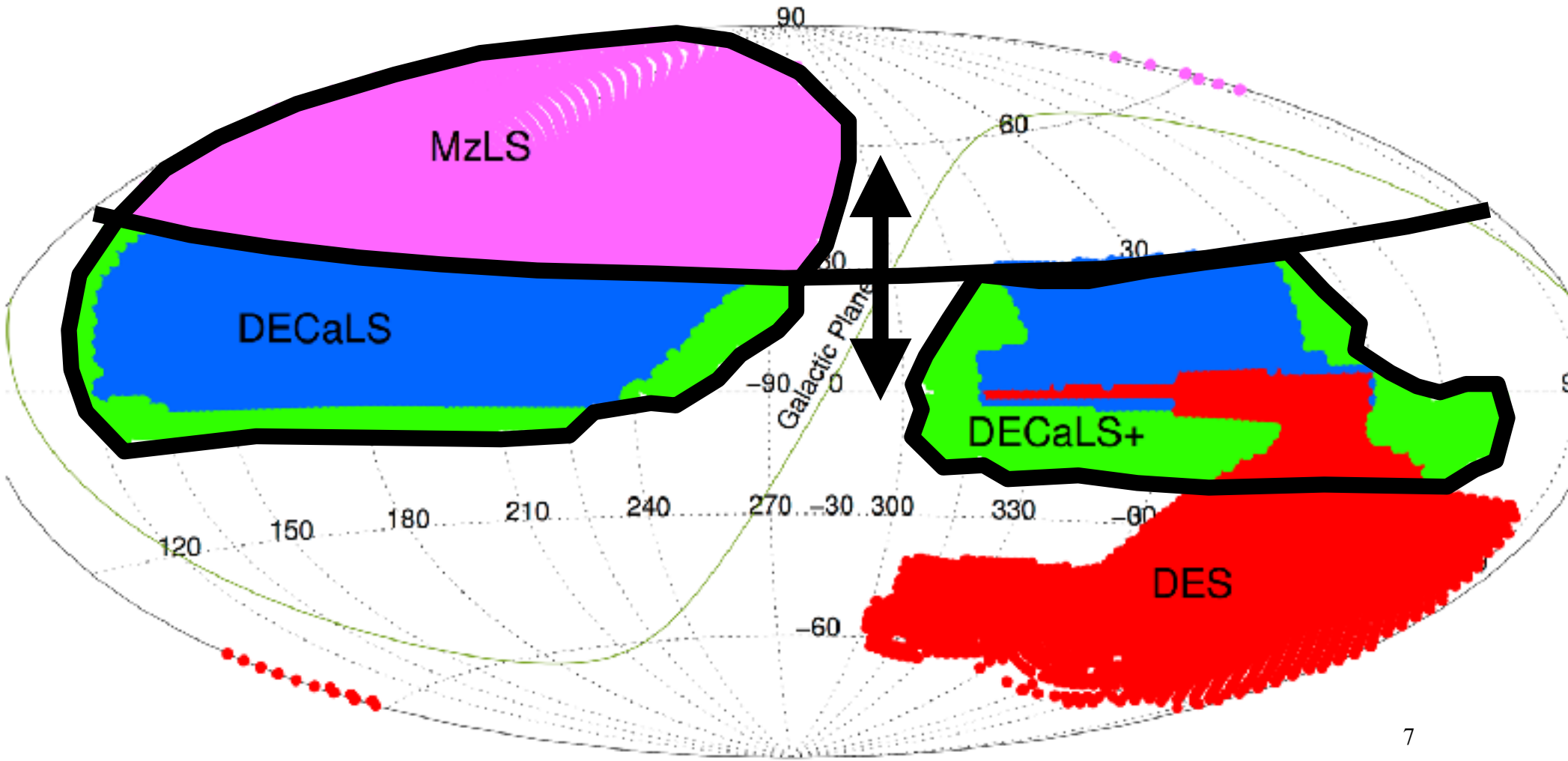
Full optical wavelength coverage gives flexibility to observe any target classes (unlike Euclid, WFIRST, …)

Deeper imaging will exist from LSST in the south,
Euclid ground+space imaging in the north
(…although all of these are broad-band filters)

Pilot programs should be encouraged using DESI

After we get lots of experience with DESI, observing
S/N —> (small) will become more possible
(SDSS is observing ~4 mag fainter than when it turned on!)

Current imaging for DESI is ~1.5 mag fainter than SDSS



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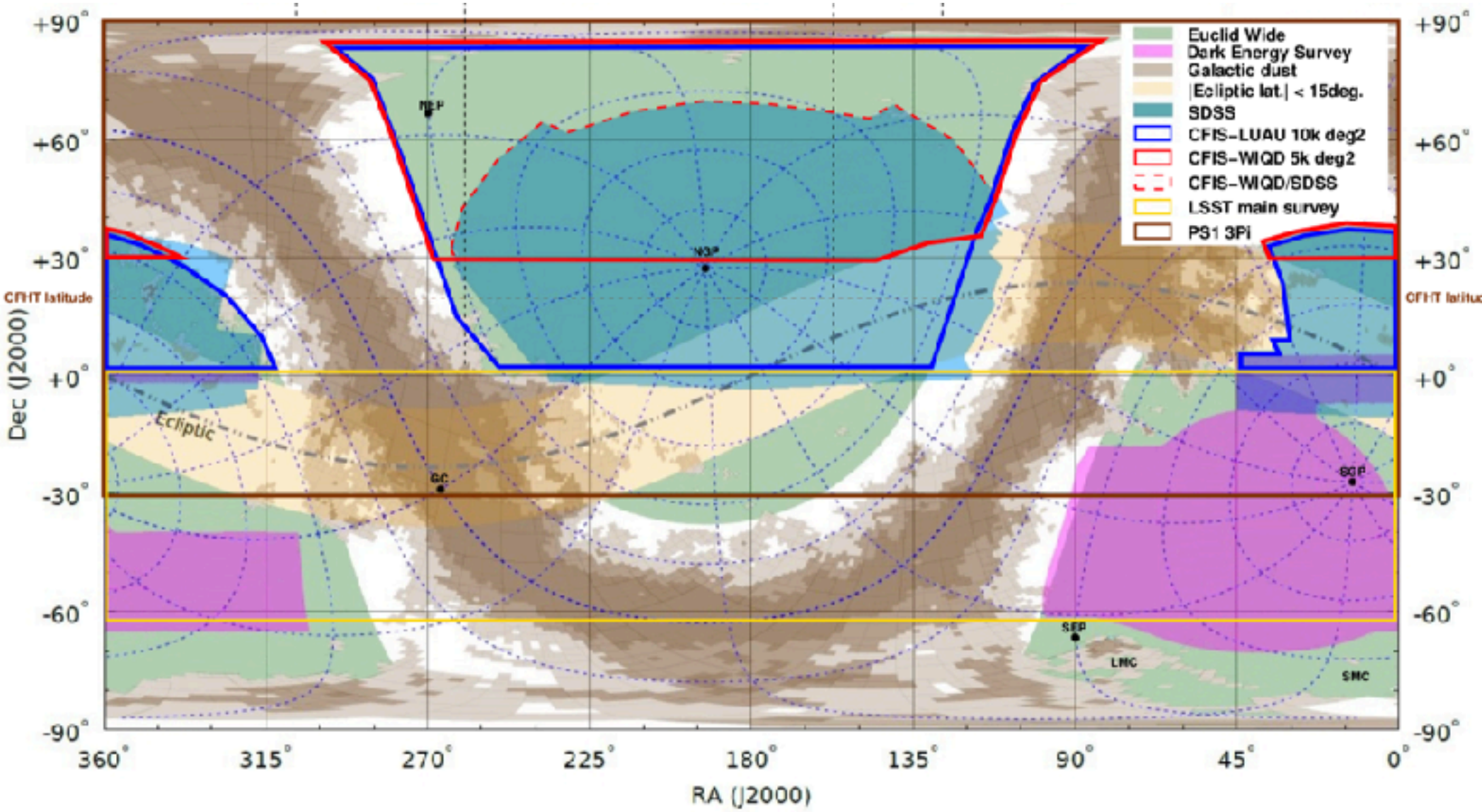
Future imaging in ca. 2025 will be ~3 mag fainter than SDSS



DESI-II targeting options can be tuned to the best science windows

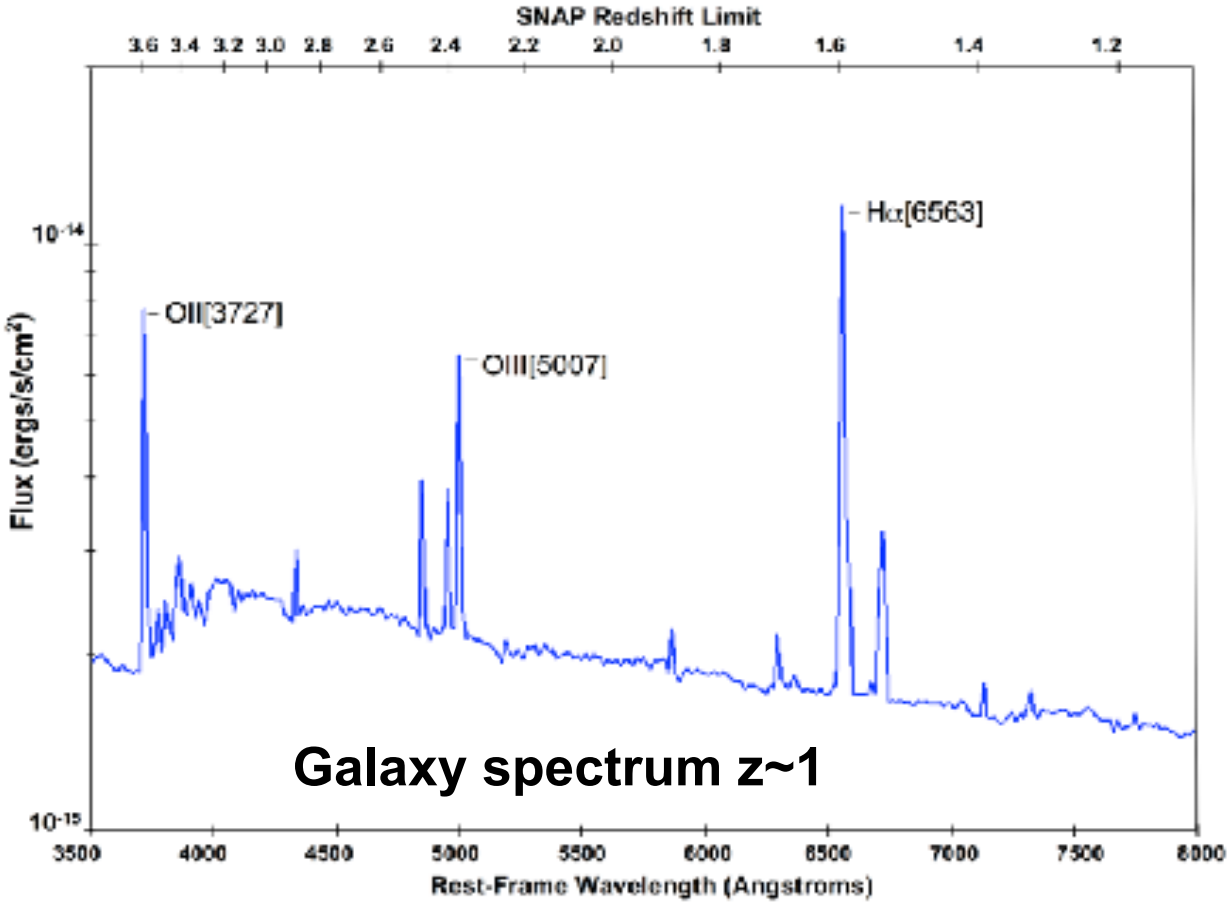
1. Fainter DESI targets, better targeting from LSST + Euclid
    1. Luminous Red Galaxies z=0.3—1.1
    2. Emission Line Galaxies z=0.7—1.4
    3. Quasar tracers z=1—4
    4. Lyman-alpha forest z=2—4
2. Bright galaxy sample, ~100M objects at z < 0.5
3. ELGs at z=1.2 - 1.6 (with existing instrument)
4. ELGs at z=1.6 - 2.0 (with upgraded instrument, GeCCDs)
5. LRGs to z=2.0 (with upgraded instrument)
6. QSO tracers fainter, targeted from LSST variability
7. Lyman-alpha emitters at z=2 - 4

Any combination of the above can be observed simultaneously

Biggest gain may be in being clever (not spending $$$$)

SDS-I/II observed at S/N > 100
SDSS-III/BOSS observed at S/N ~10
SDSS-IV/eBOSS observing at S/N ~ 5

DESI will observe at S/N ~ 10
DESI-2 studies at S/N ~ 5



Galaxy spectrum z~1

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Biggest gain may be in being smarter (not spending $$$$)

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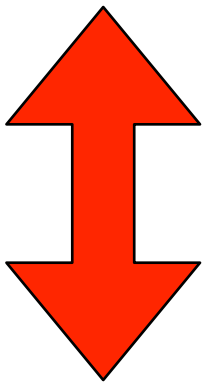
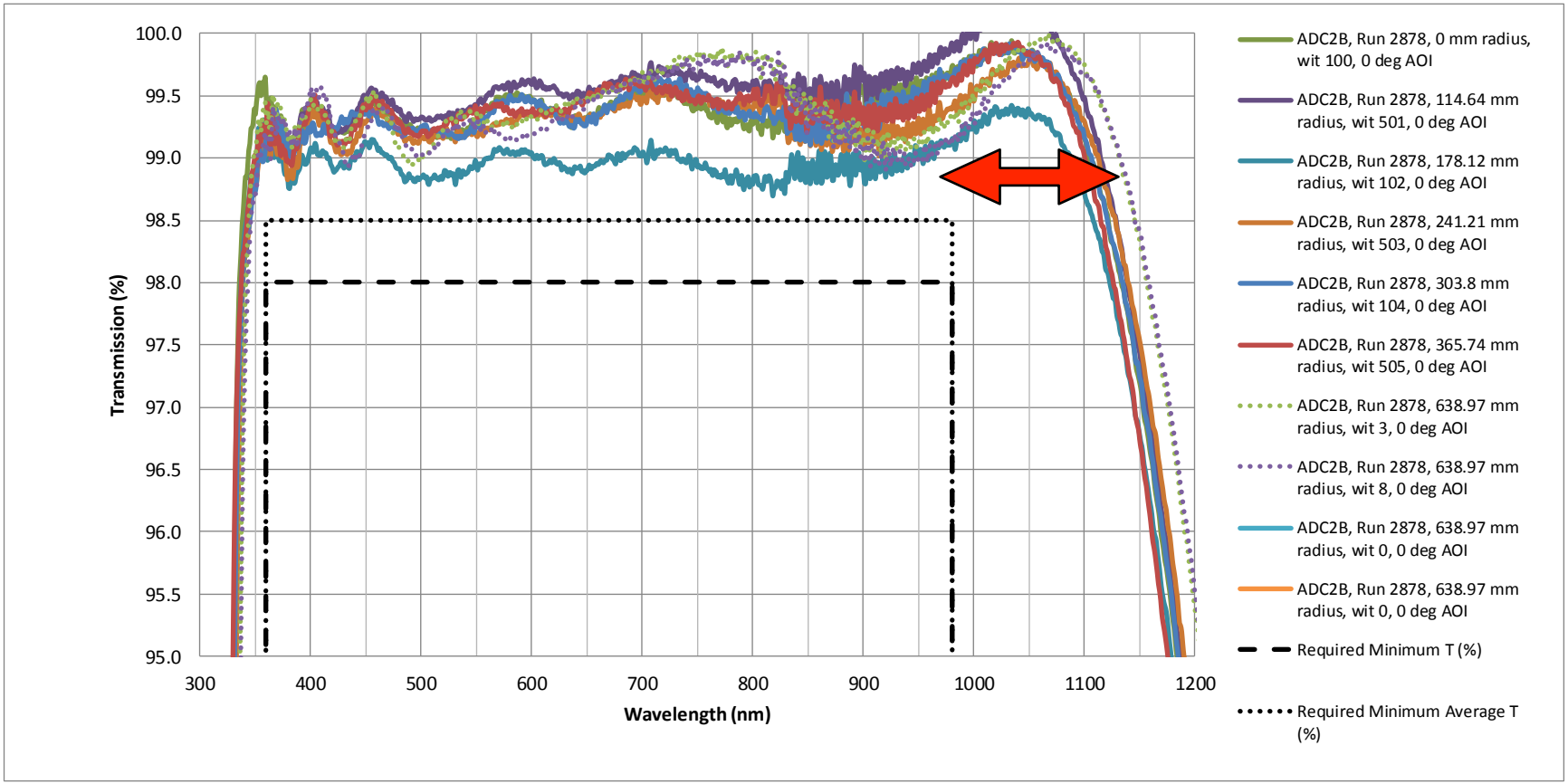


Opportunity space!
(N.B. Lower-noise detectors needed!)

21-cm surveys happy to work at S/N ~ 0.1

Extending the DESI instrument into the infrared is possible (with complications)

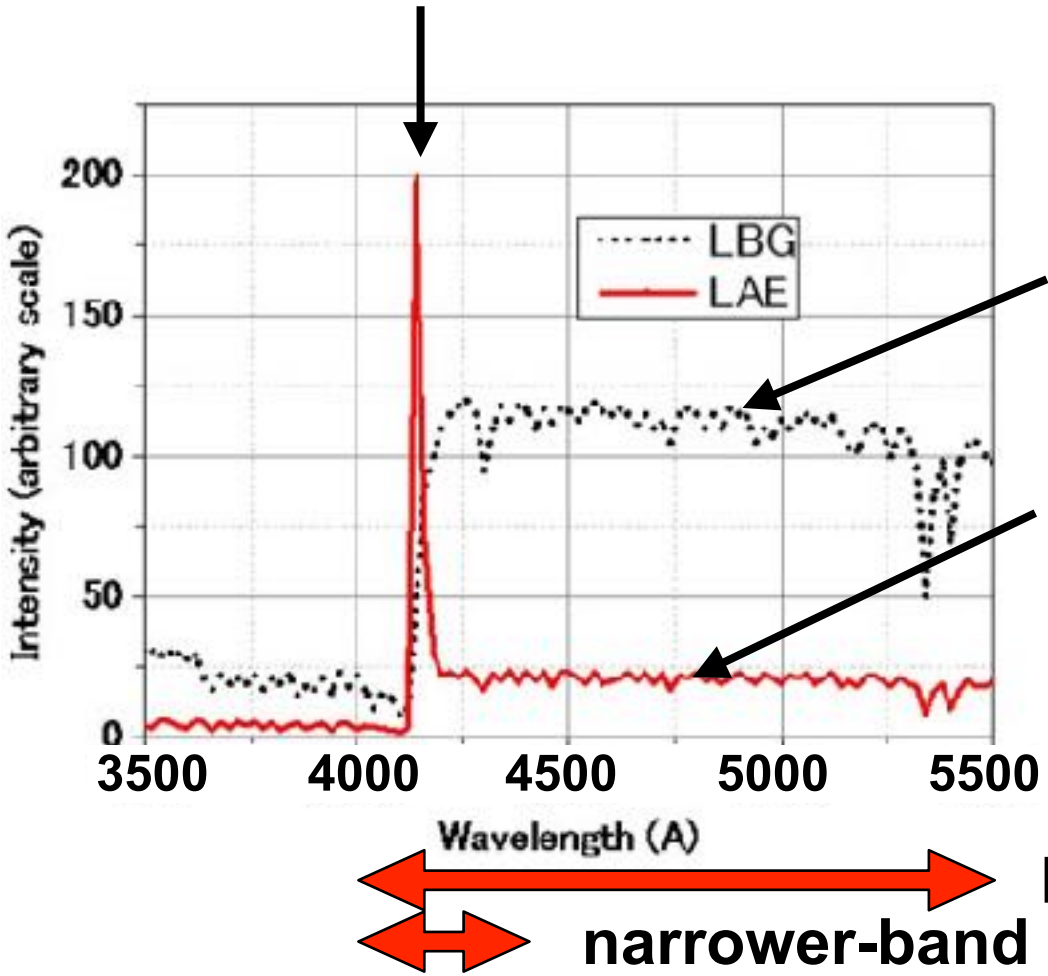
Telescope corrector optics performant to ~1.1 micron
Upgrade with Germanium CCDs



Lyman-alpha emission galaxies are the low-hanging fruit at z=2—4

DESI is already the perfect instrument for these galaxies
Broad-band imaging will exist in 2025 to select some
<u>Better</u> would be narrow-band imaging to select all

Lyman-alpha for redshift



Select from CFHT, LSST

Select from narrower-band imaging

broad-band (g)

narrower-band