

Utilizing SweetSpot Host Galaxies for LSST

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*Preparing for SN science in the
LSST era: A kick-off workshop*

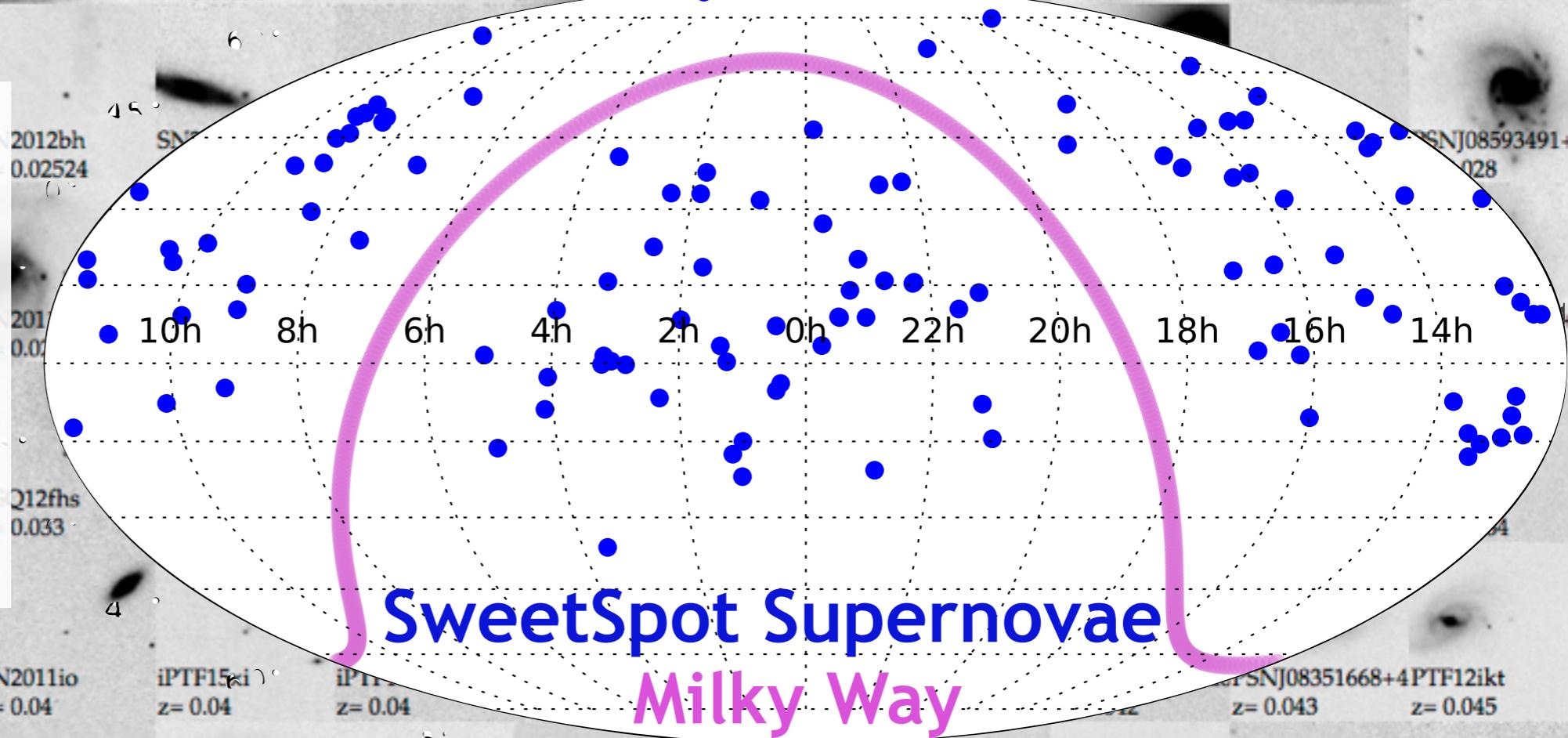


SweetSpot: 3-year 72-night NOAO Survey on WIYN+WHIRC

- ❖ Extend H-band Hubble diagram to $z \sim 0.08$
- ❖ Quantify how standard SN Ia are in the NIR, particularly in H.
- ❖ Improve understanding of colors of SNeIa
- ❖ Provide a standard well-calibrated rest frame reference for future higher redshift surveys.
- ❖ Test correlations between luminosity and host galaxy mass, SFR, and environment in NIR

115 Supernovae were Observed

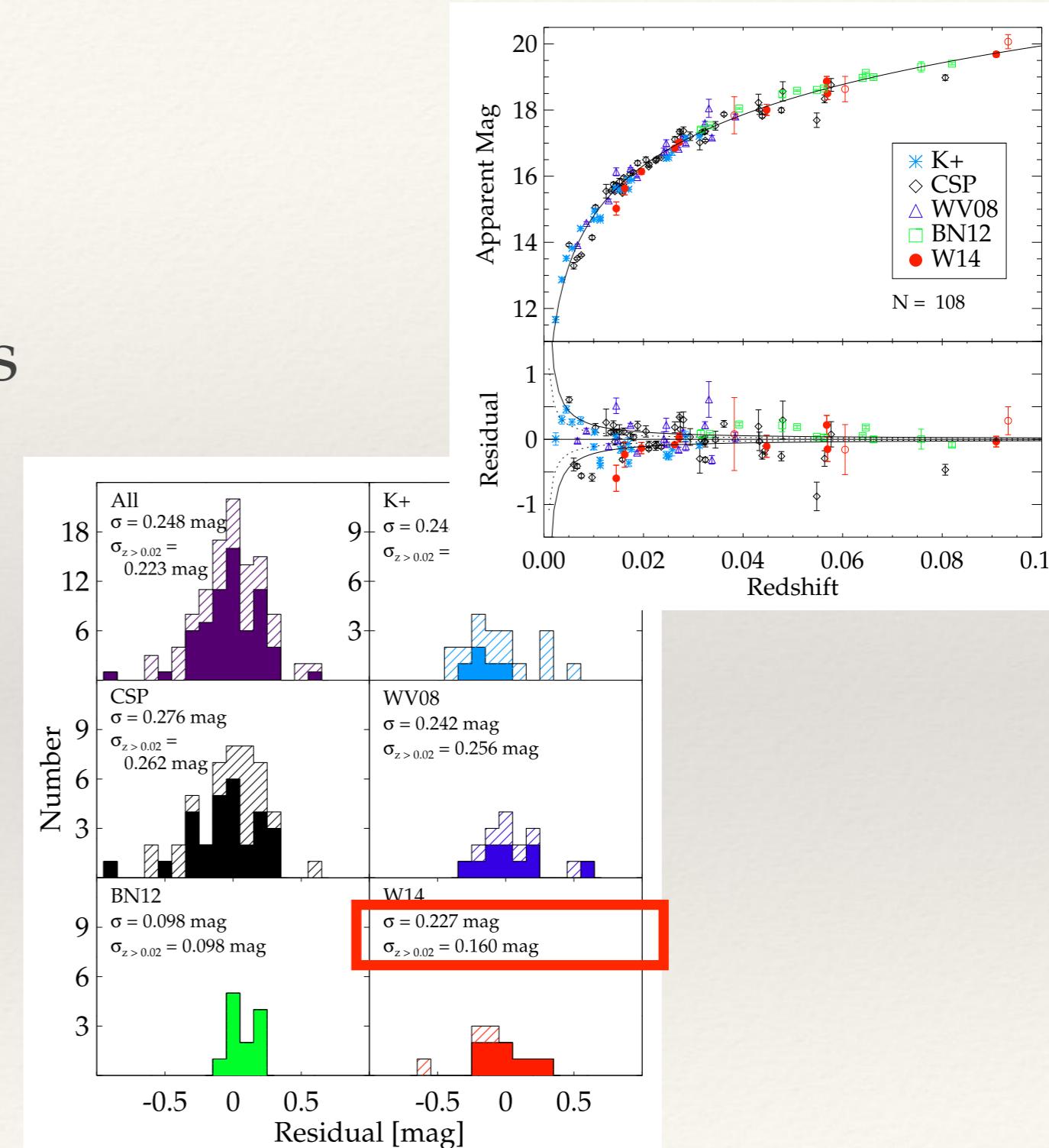
- ❖ 88.5 nights
- ❖ 114 SNeIa
- ❖ 1 SN IbN



- ❖ 60 SNe with optical follow-up from Super-LOTIS
- ❖ Median 3 points per H-band light curve
- ❖ Median Redshift: 0.033

SweetSpot Timelines

- ❖ Pilot: Weyant et al (2014)
 - ❖ 11 SNeIa with light curves
- ❖ Data Release 1: Fall 2016
 - ❖ 74 SNeIa, 31 light curves
- ❖ Data Release 2: Spring 2017
 - ❖ 115 SNe with light curves

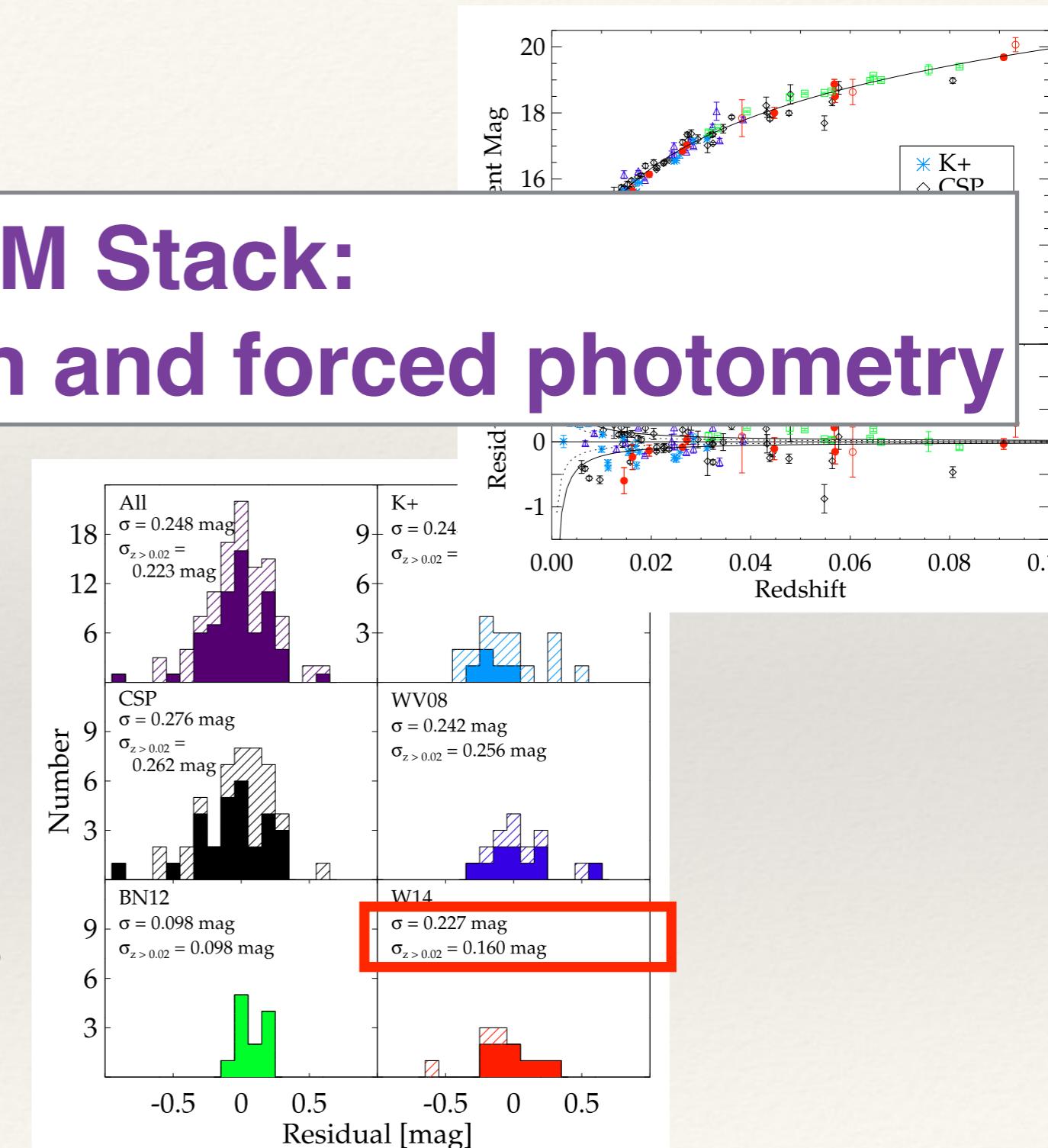


SweetSpot Timelines

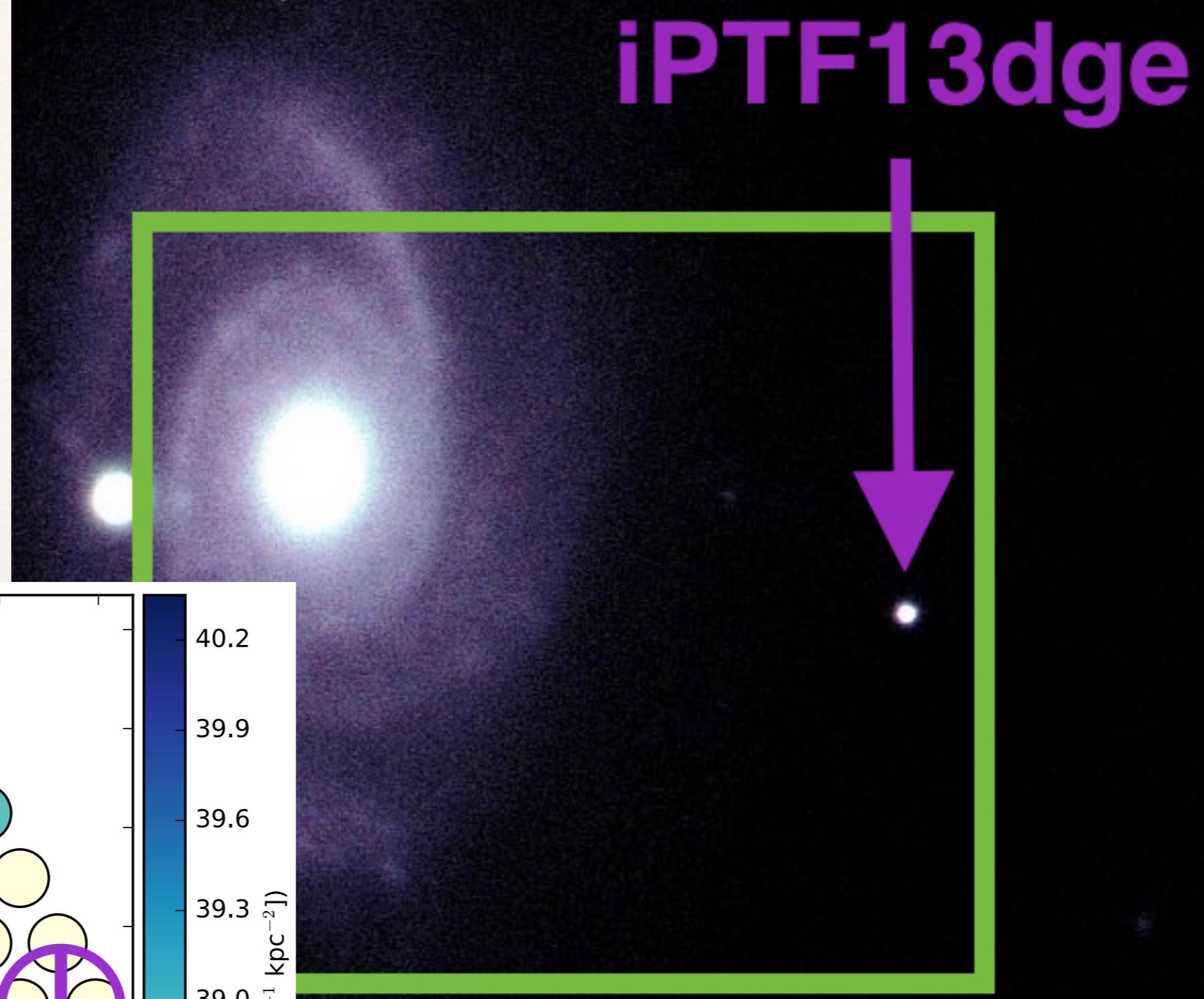
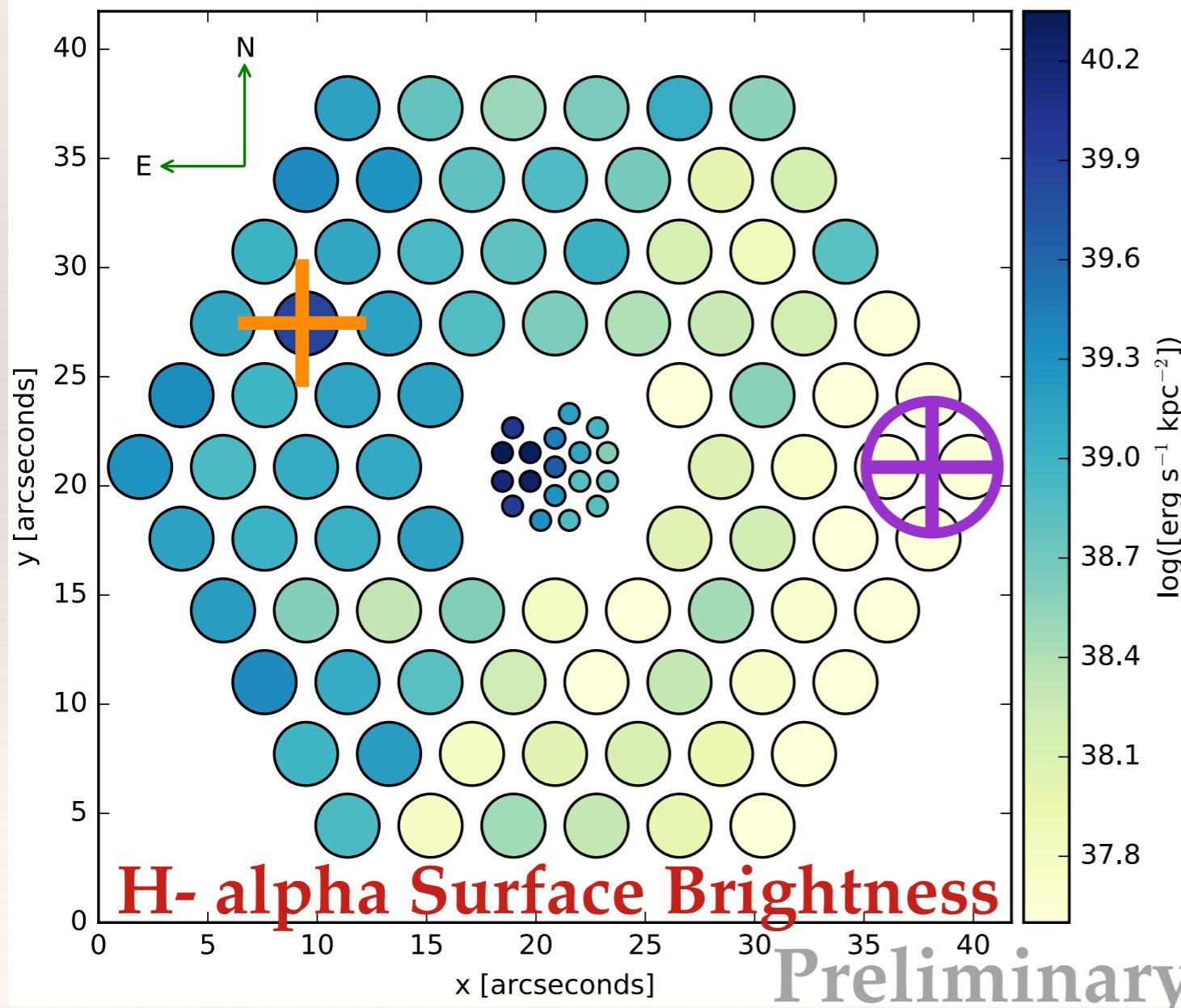
LSST Data Release 1 (2016)

LSST DM Stack: Host galaxy subtraction and forced photometry

- ❖ Data Release 1: Fall 2016
 - 74 SNeIa, 31 light curves
- ❖ Data Release 2: Spring 2017
 - 115 SNe with light curves



IFU Spectra of 32 SweetSpot Host Galaxies using HexPak

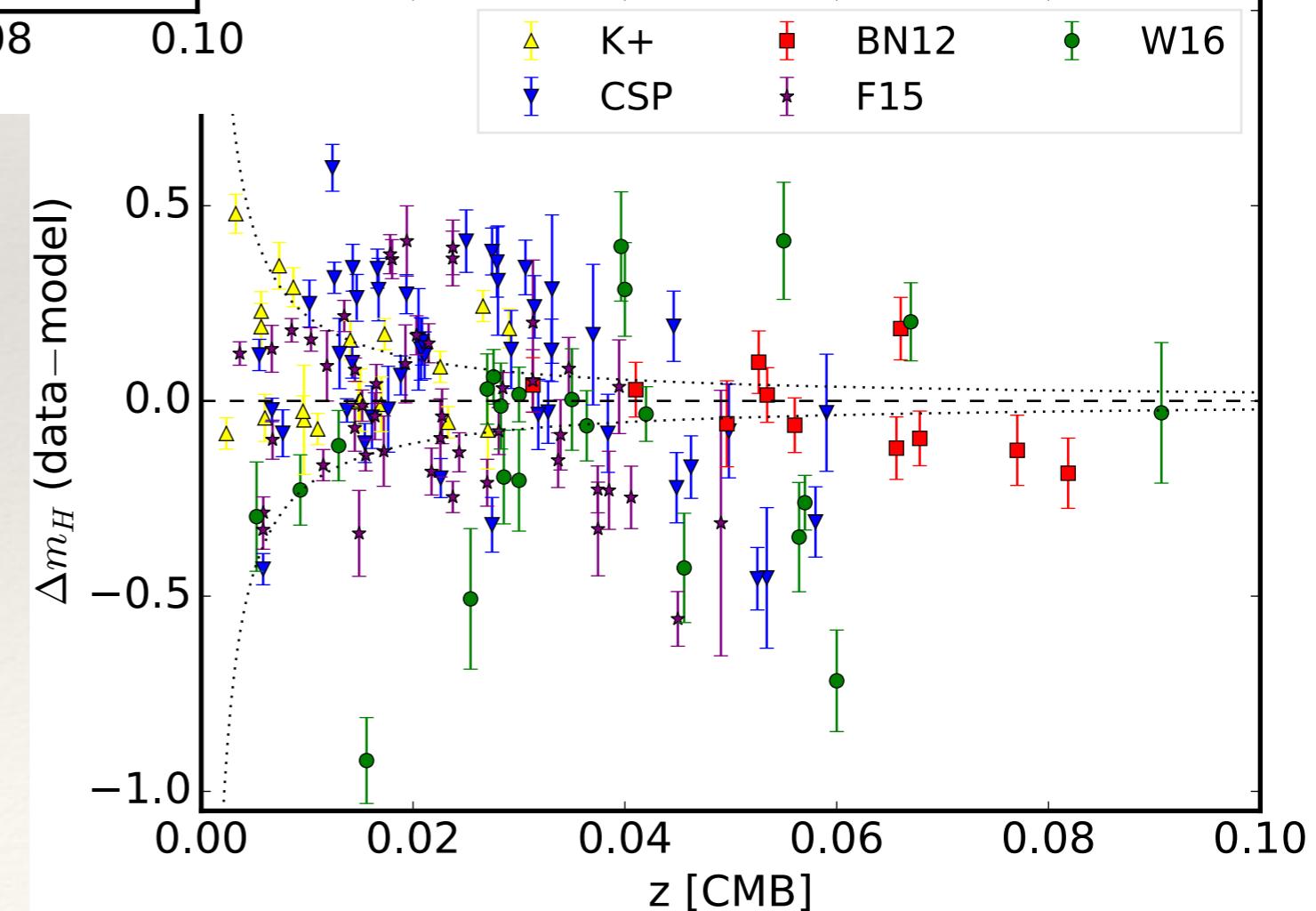
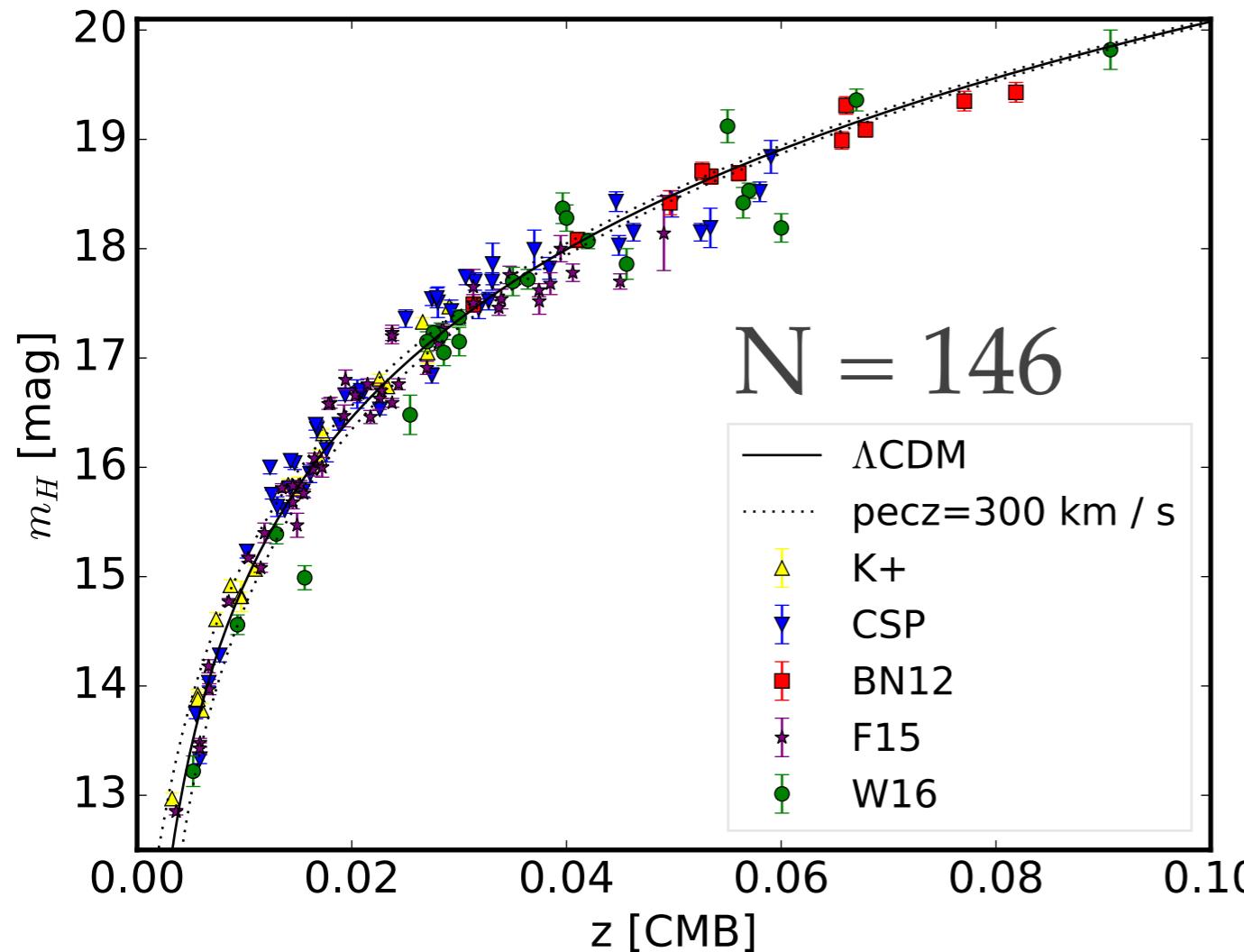


iPTF13dge
More IFU data to
come with
AMUSING, PMAS,
MaNGA

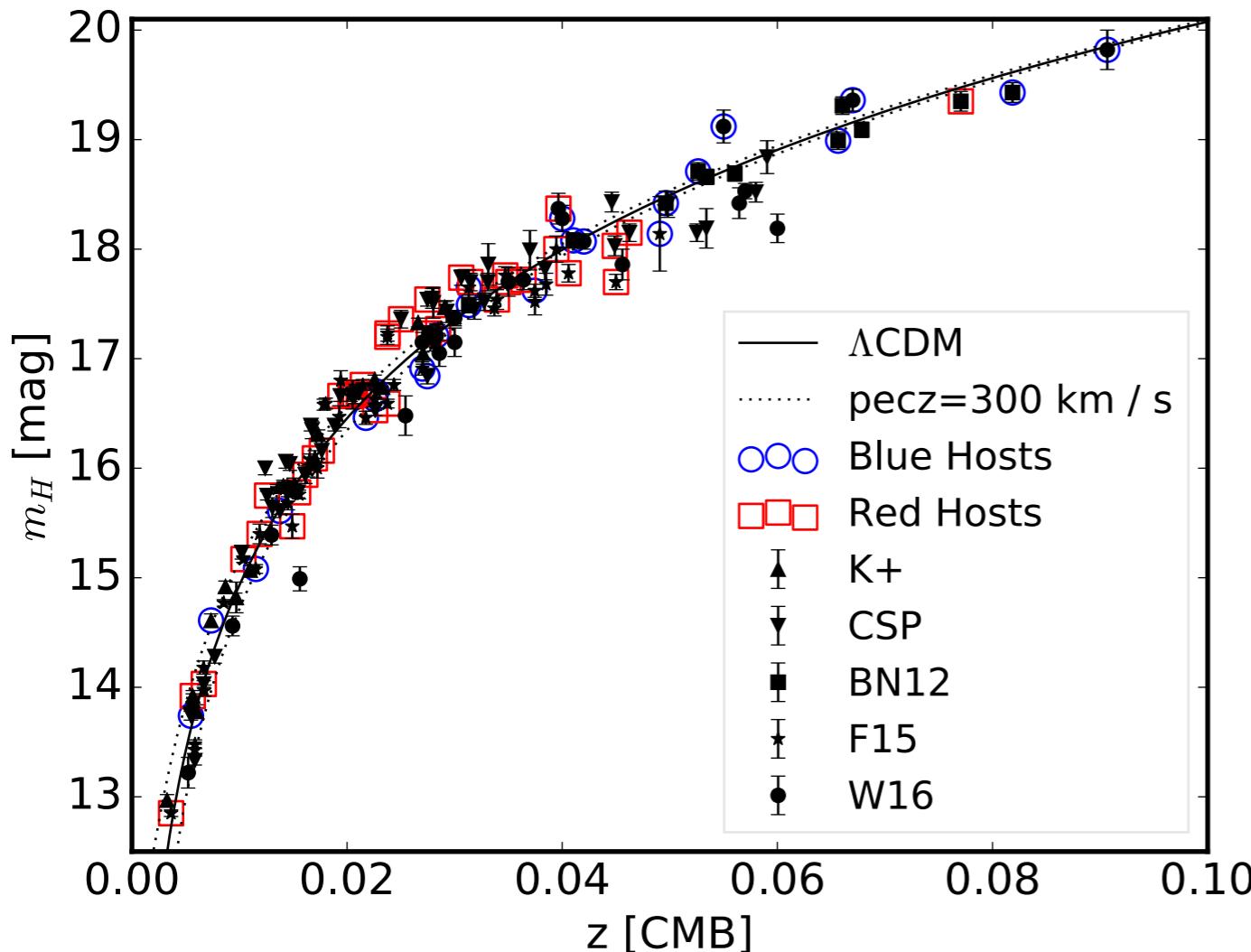
What can LSST gain with this data?

- ❖ Explore synergies with LSST and WFIRST
 - ❖ Optical+NIR photometric light curves with IFU host galaxies
- ❖ Understanding the nearby universe to apply to high redshift
- ❖ New models for host galaxy correlations
 - ❖ Explore local versus global properties
 - ❖ Explore correlations with limited host galaxy information
 - ❖ Search for astrophysical source of these correlations

H-band Hubble Diagram and Residuals



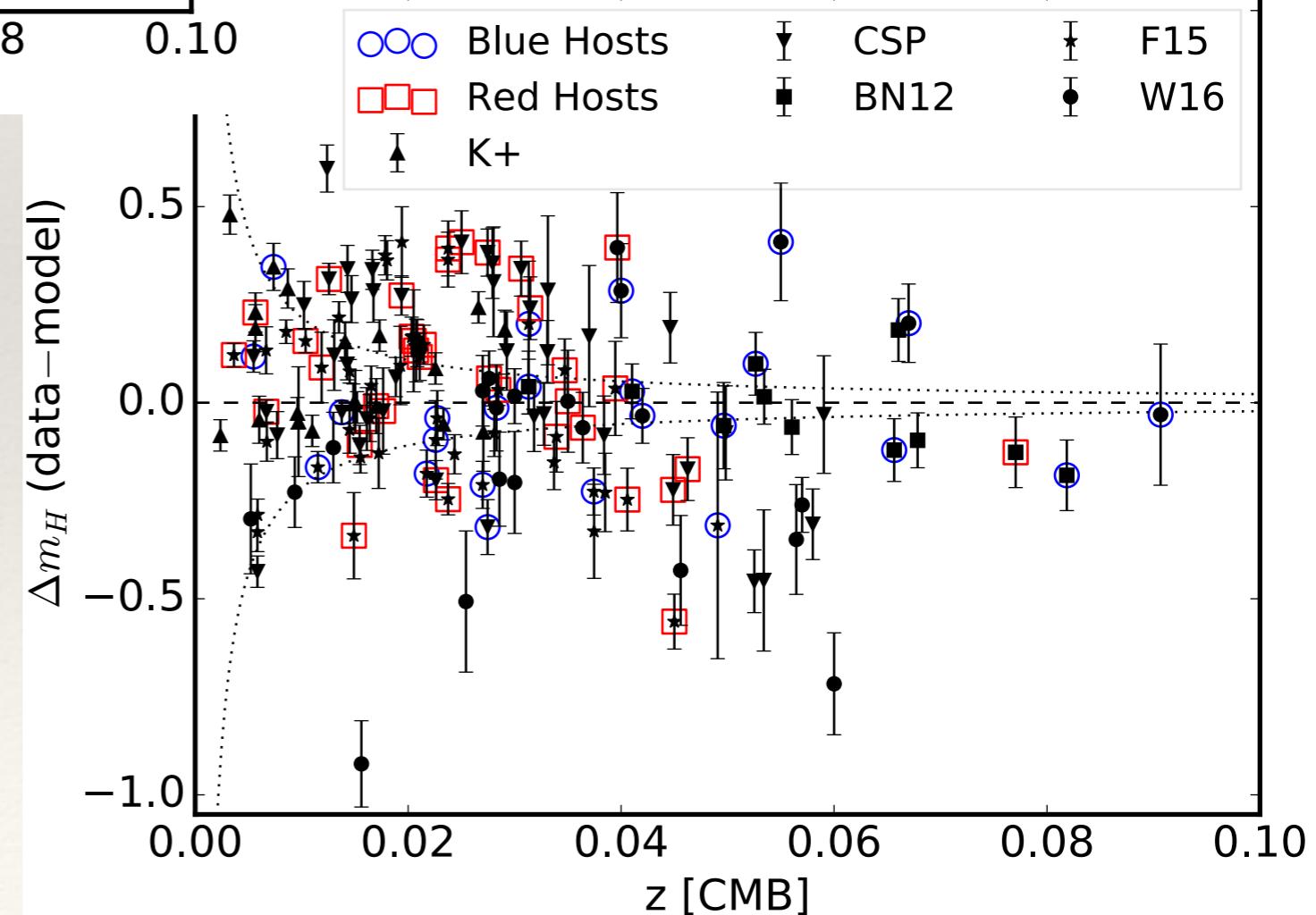
Color of Host Galaxy from SDSS



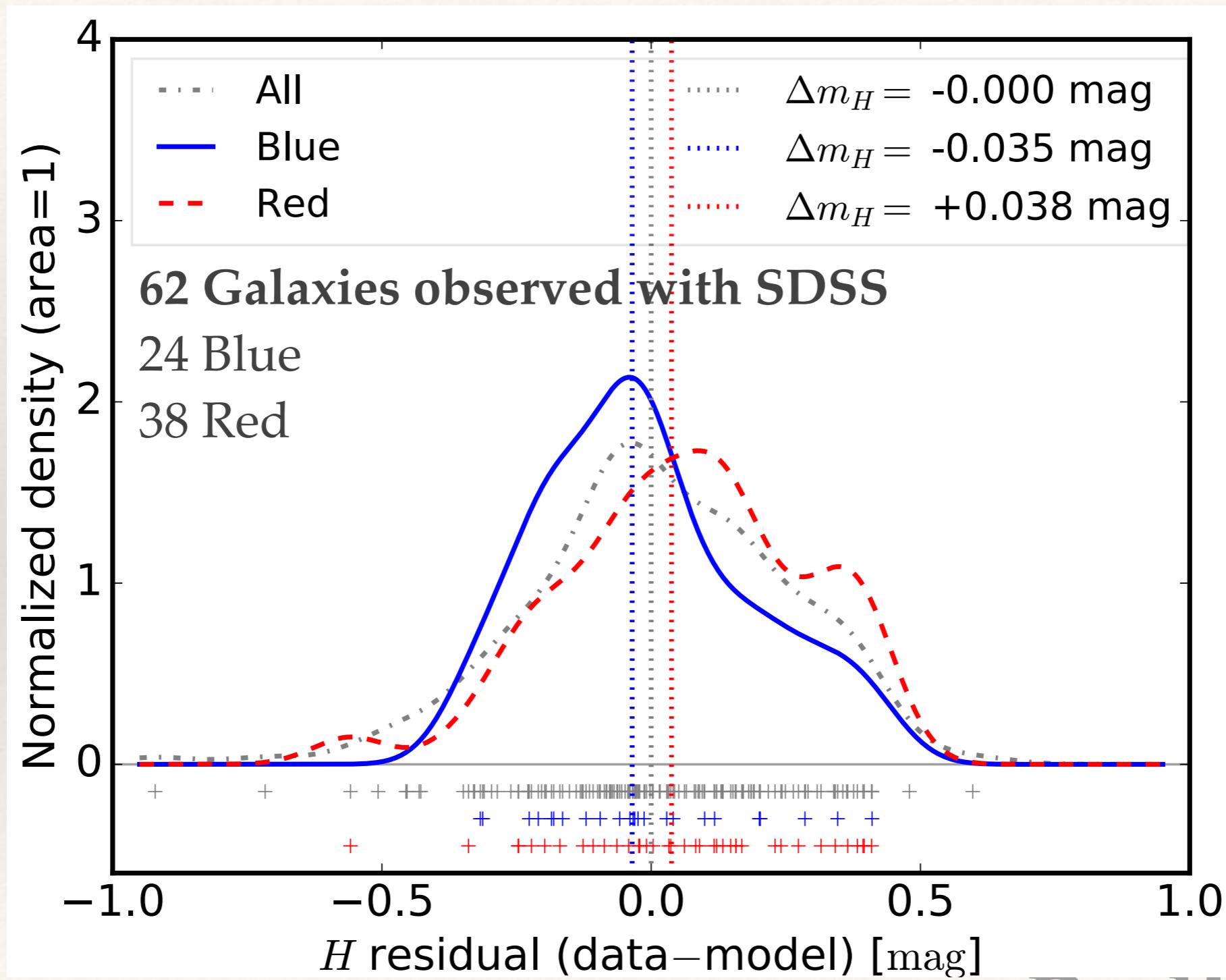
62 Galaxies observed with SDSS

24 Blue

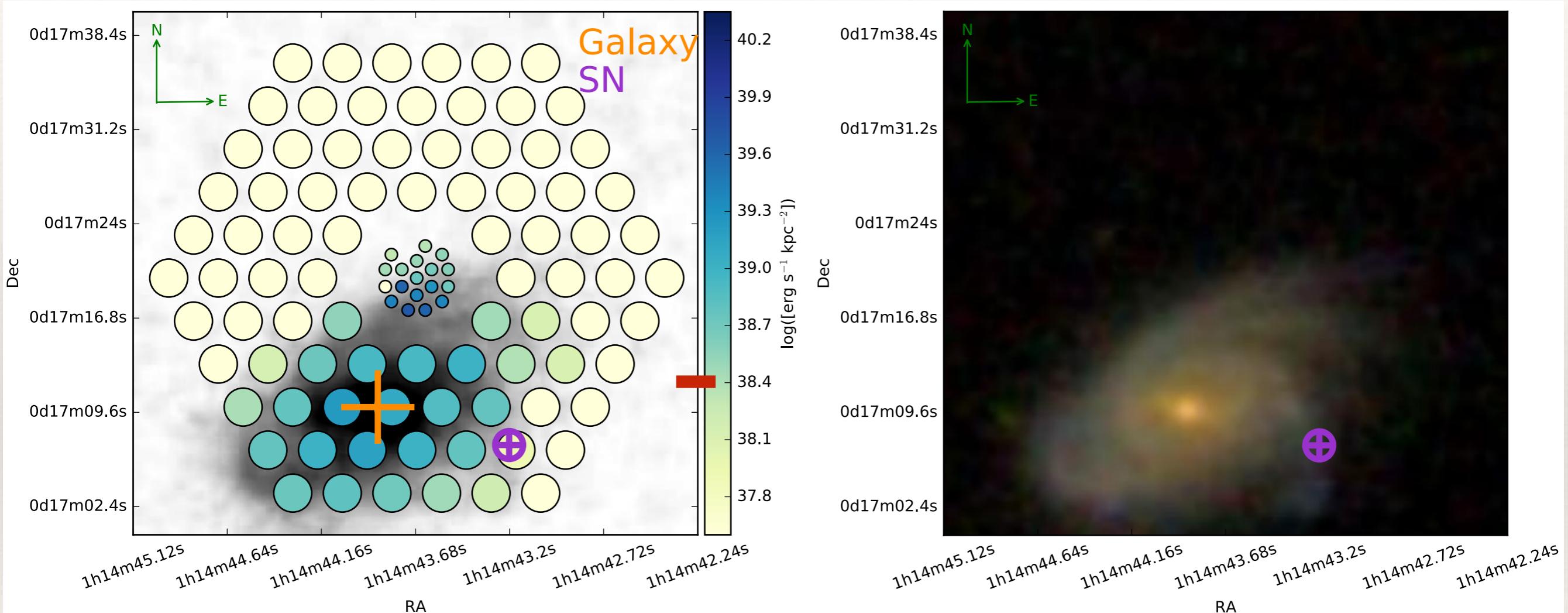
38 Red



Residuals Correlate with Host Galaxy Color



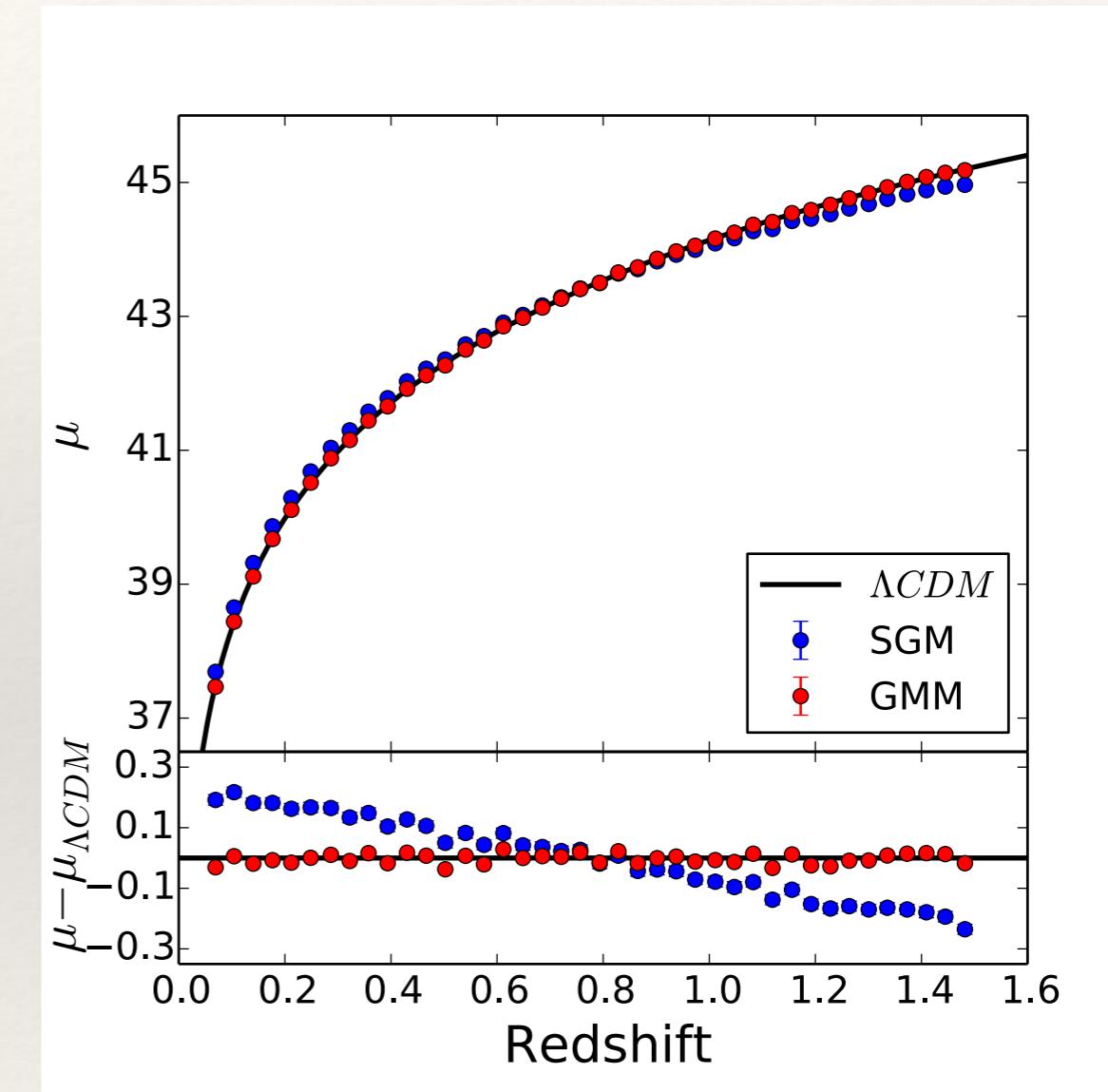
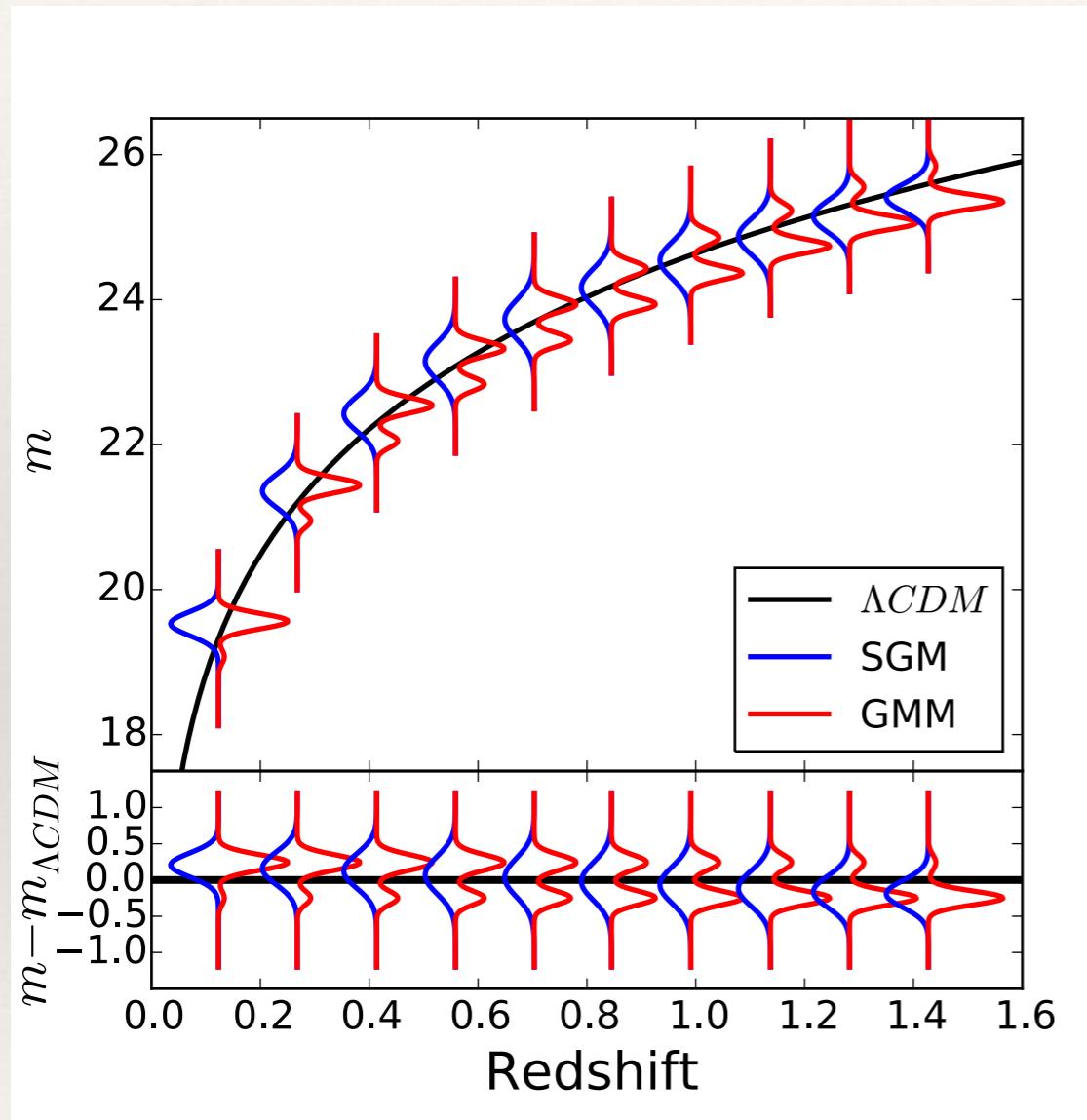
Local Star formation Rates



iPTF12ikt
z = 0.045

Multiple populations affecting parameter estimation

Ponder et al (2016), arXiv:1511.04647

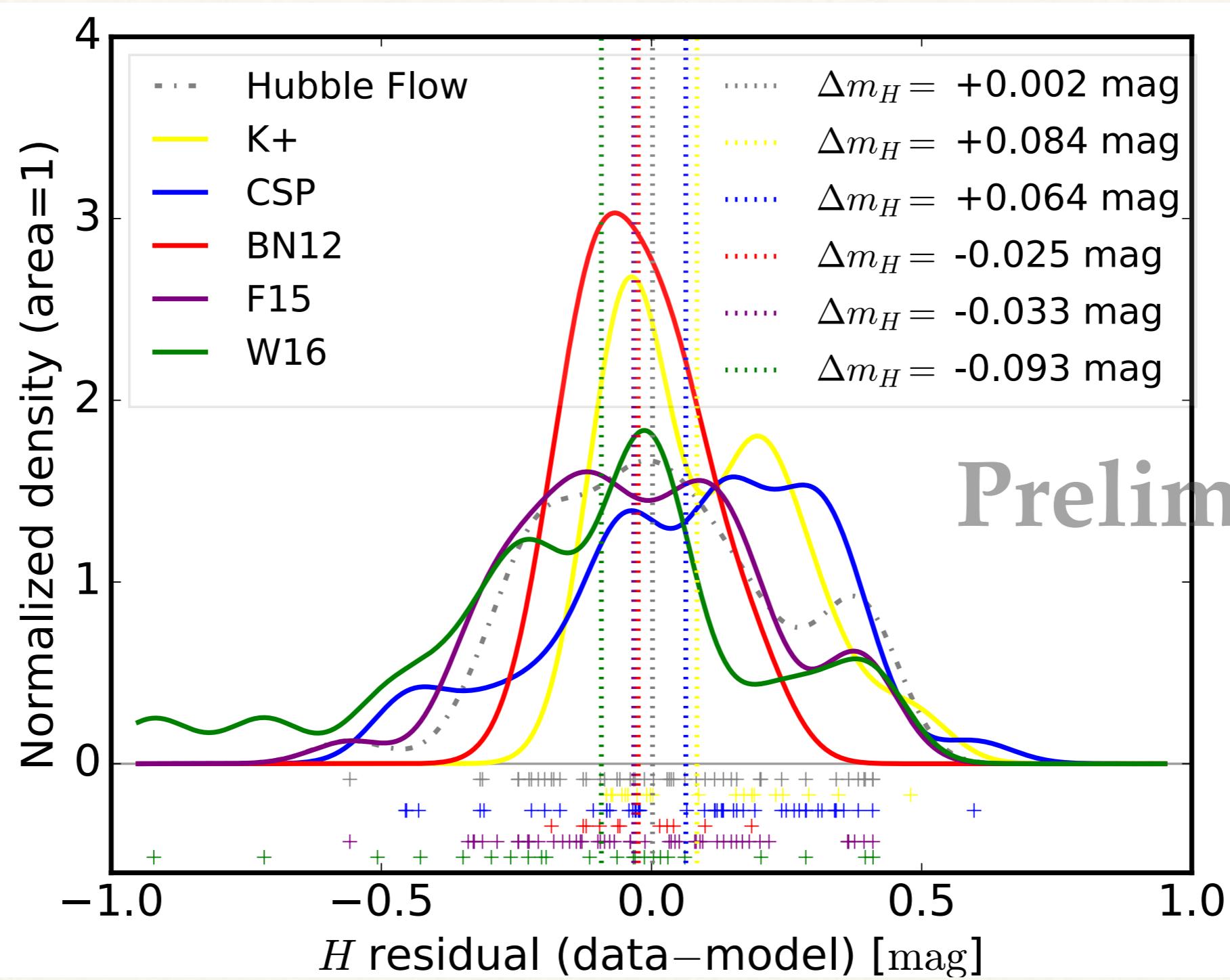


- ❖ Generating models to apply as host galaxy correlations into likelihoods

Thank you!

- ❖ SweetSpot will contribute 114 SNeIa to NIR dataset. Full data set of photometric light curves in 2017.
- ❖ Will host galaxy correlations hold in NIR?
 - ❖ We are examining global and local host galaxy color, mass, and SFR indicators through SDSS, GALEX, and local H-alpha measurements.
 - ❖ Search for astrophysical motivation behind possible correlations and apply new models in parameter estimation methods
- ❖ Interesting test bed for WFIRST+LSST

Differences between surveys comparable to Host Galaxy Color relation



Correlation with Host Galaxy Mass

