Filter study using SNe simulations and photoZs

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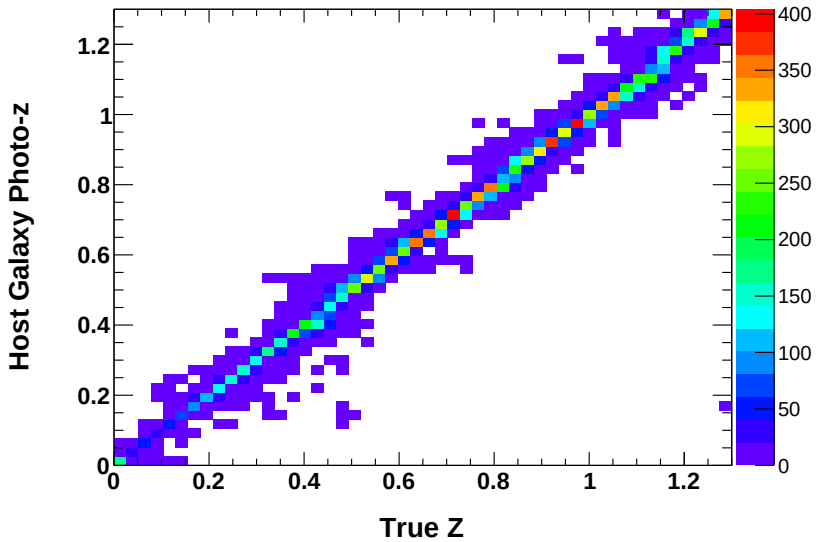
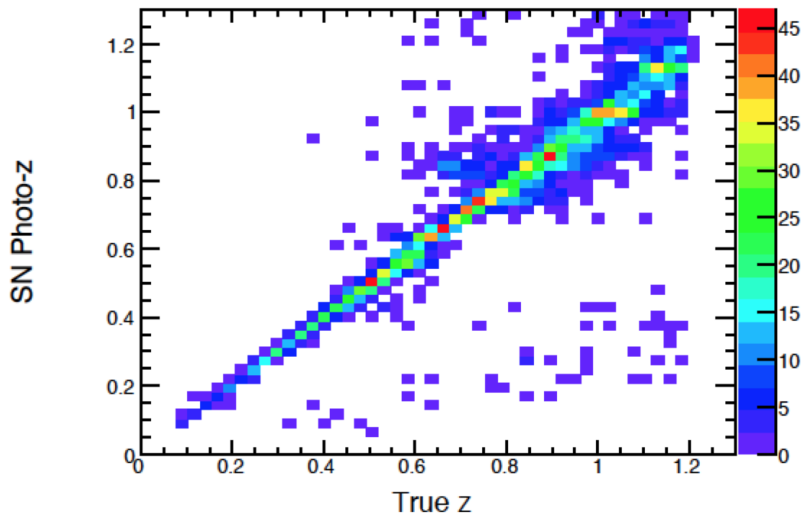
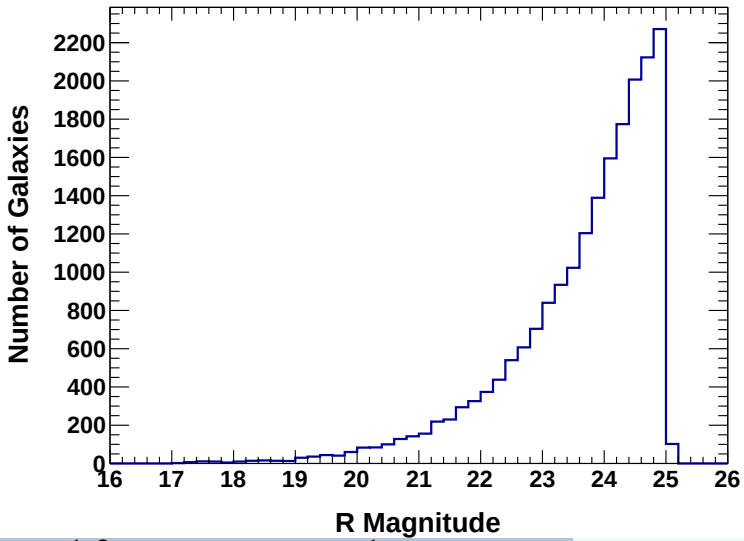
Overview

- Using SNANA to simulate supernovae photo-z for 6 filter options (including 4 vendors)
  - Simulated 10 seasons of 10 LSST Deep fields (v2_168) all filter options
- Five different photo-z fitting scenarios (no cosmology prior)
  - supernova only, SNANA (Kessler et al., ApJ 717, 2010) χ^2 fit
  - supernova only, SNCosmo (`sncosmo.readthedocs.org`) χ^2 fit
  - supernova only, SNCosmo nested sampling
  - supernova + host photo-z prior (Schmidt library), SNANA χ^2 fit
  - SN + host photo-z increased host photo-z error by a factor of 2.5, SNANA χ^2 fit

Host only and supernova only photo-z

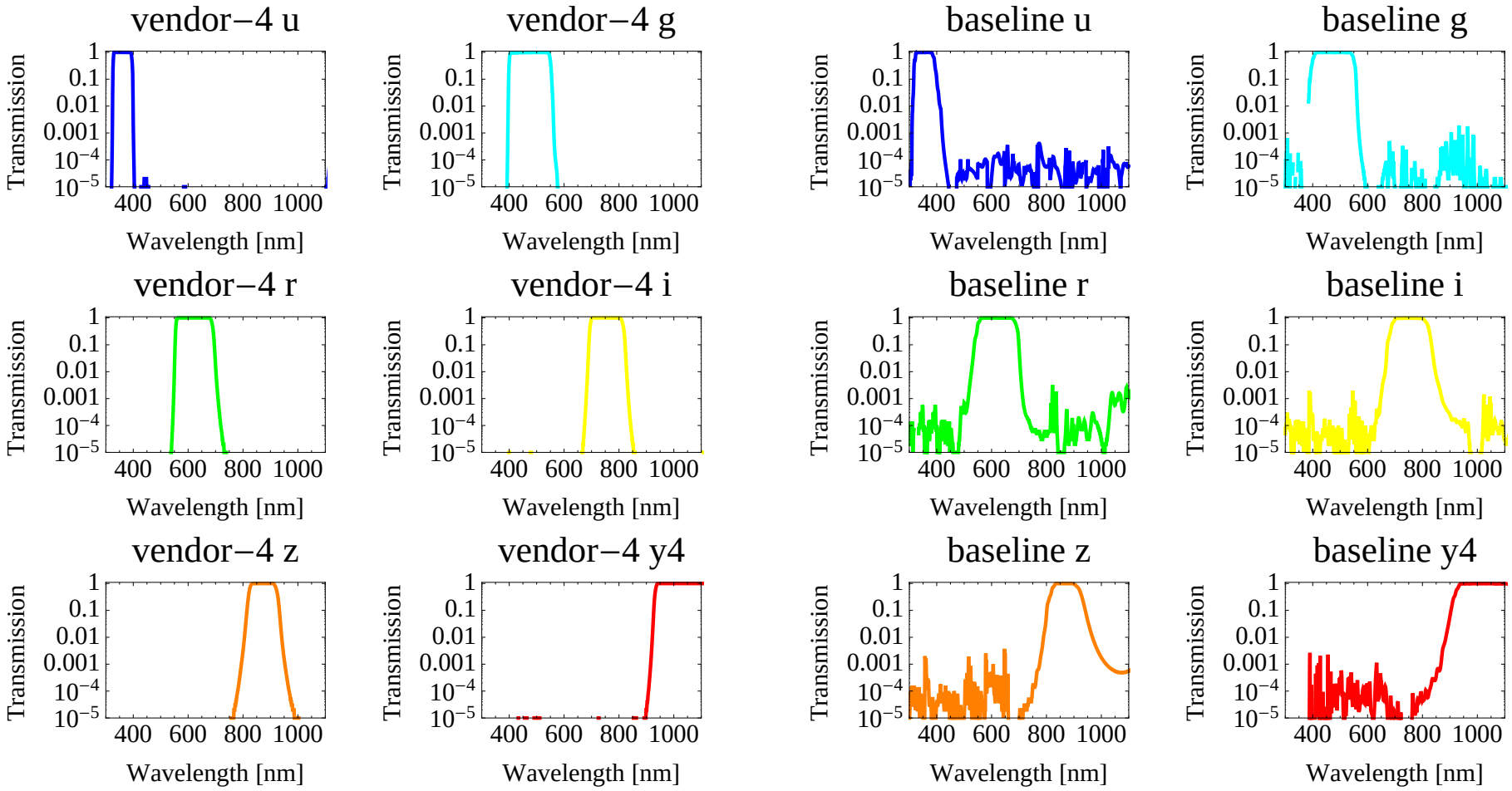




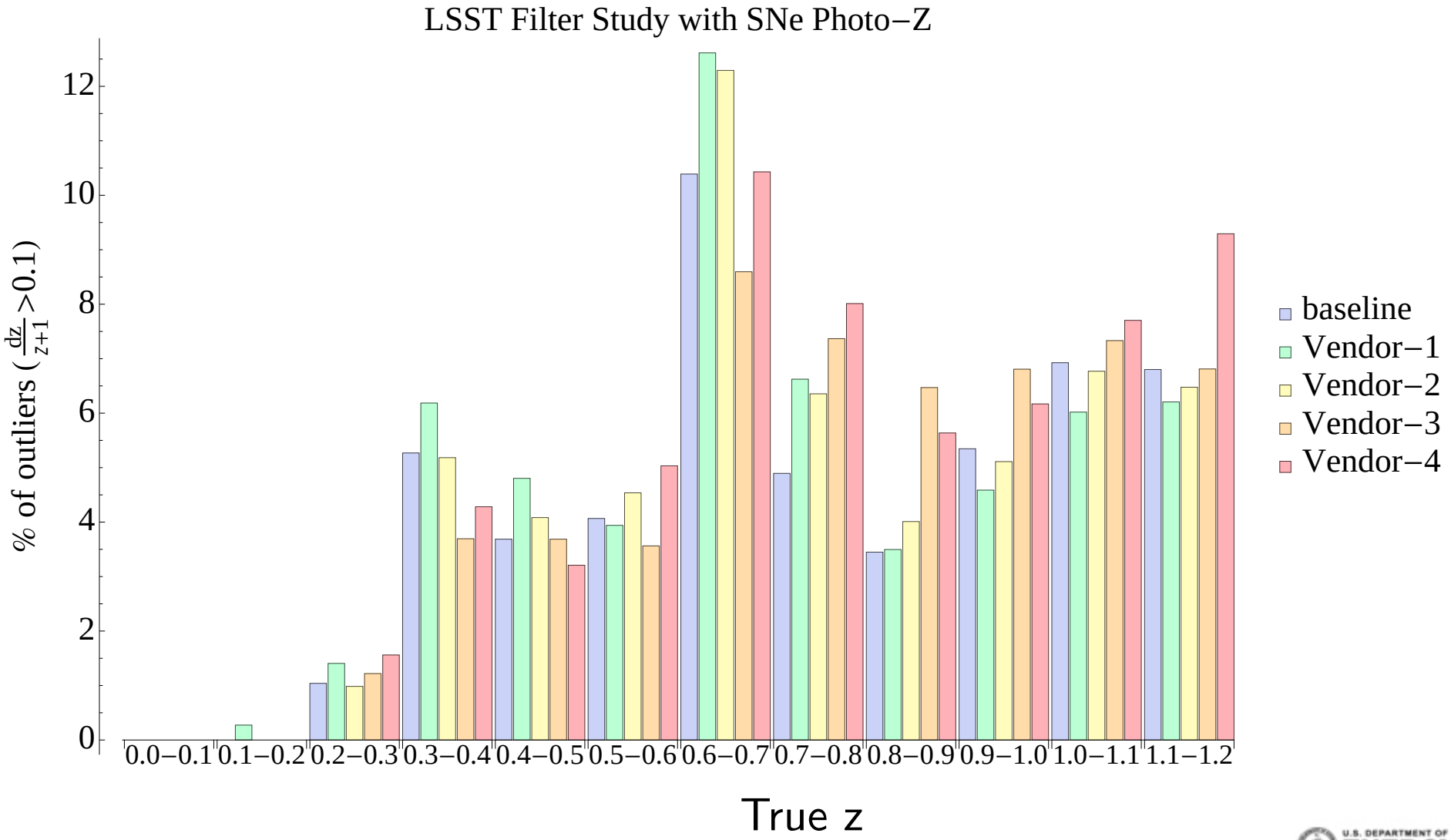


- **Left plots** are from SNANA LSST galaxy photo-z library
  - From 2009
  - Looks cleaner than Science Book plot?
- **Right plots** Supernova only SNANA χ^2 photo-z

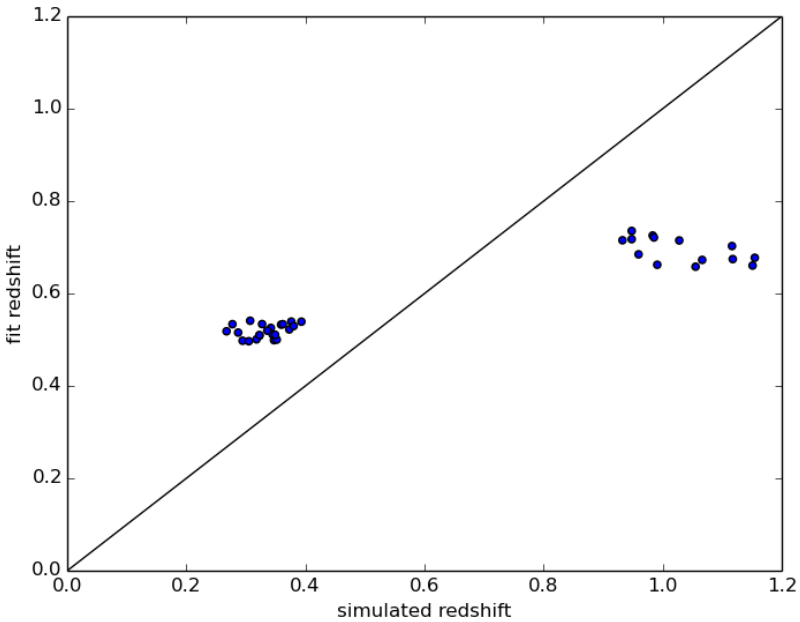
Vendor-4 leakage (lowest leakage of all vendors)



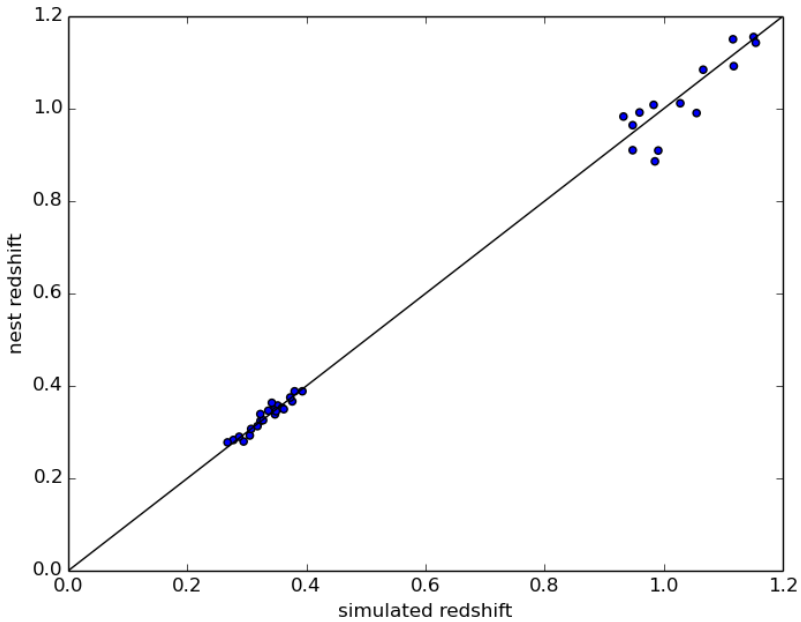
Outlier plot with leakage (no current clear trends between vendors)



SNCosmo photo-z outliers

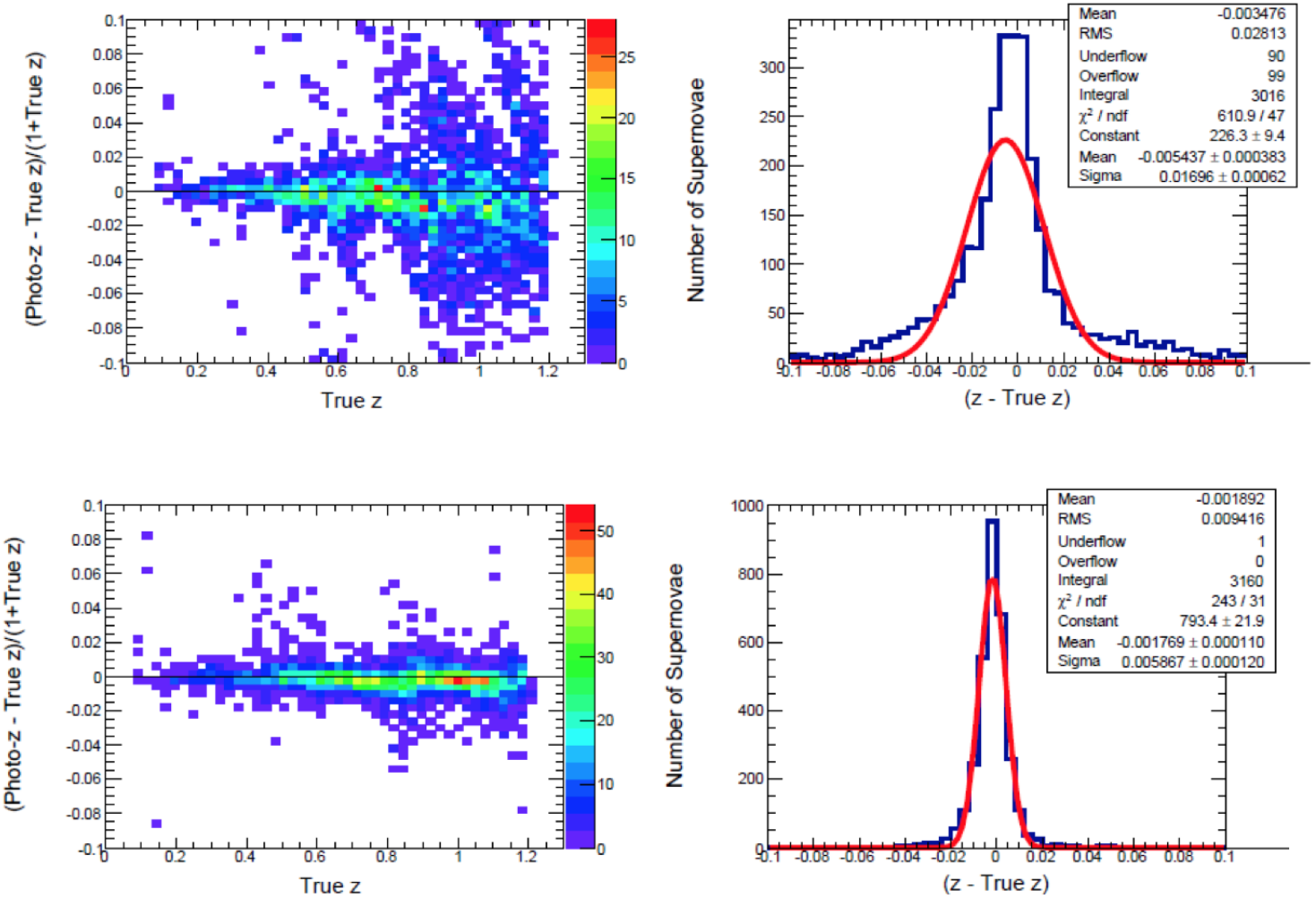


outliers with χ^2 minimization



outliers rerun with nested sampling

Comparison of SN photo-z without and with host info, for Vendor-1



Does Supernova add useful information to host PhotoZ?

Yes.

	RMS
SNANA 2009 Galaxy Library $\rightarrow$ PhotoZ-TrueZ	0.027
SNANA 2009 Galaxy Library $\rightarrow$ Monte Carlo with PhotoZ Error	0.023
SNANA 2009 Galaxy Library as prior for Supernova (Photoz-TrueZ)	0.016
SNANA 2009 Galaxy Library $\rightarrow$ Monte Carlo with PhotoZ Error*2.5	0.056
SNANA 2009 Galaxy Error*2.5 as prior for Supernova (PhotoZ-TrueZ)	0.021

Conclusions

- Current Fitter choices in SN-only Photo-z seemingly more important than physical effects due to filters.
- Adding host photo-z prior dramatically improves the photo-z fits with χ^2, and with pessimistic host photo-z errors the addition of SN information makes a significant difference.