

Filters Proposed for the Supernova Survey

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Mixed Imaging/Spectroscopic Survey

- Assume WFIRST as Omega Design with 1.5 m obstructed view (on axis) Telescope
- Started out considering a survey with spectroscopy only
 - Use spectra to type supernovae, measure redshifts, and obtain precision lightcurves from spectrophotometry
 - Places no requirements on filters
 - Spectrometry with slitless prism spectrometer very slow due to high backgrounds
- We all agreed that a survey using both imaging and spectrometry is the way to go

Imaging/Spectroscopic Survey

- Split each 30 hour visit between imaging and spectroscopy
- Use imaging in many filters to obtain the lightcurves
- Use the spectra to determine that we have a Type 1a and to get the redshift
(requires shorter exposure times compared to using spectra to get precision lightcurves)

Proposed Filter Bands for Imaging

- Set up 5 filter bands as follows, all with $\lambda/\Delta\lambda = 4.5$
Note: will also need a 6th position on Filter Wheel for Prism
- These are similar in spirit to the set mentioned by Paul
(0.4-0.6, 0.6-0.85, 0.85-1.1, 1.1-1.4, 1.4-1.7)
but shifted up by 0.2 or 0.3

Filter No	λ central	$\Delta\lambda$	Range
1	0.72	0.1600	0.60 to 0.80
2	0.90	0.2000	0.80 to 1.00
3	1.15	0.2556	1.02 to 1.28
4	1.45	0.3222	1.29 to 1.61
5	1.80	0.4000	1.60 to 2.00

A 3 Tiered Imaging/Spectroscopy Survey

Will image each area in three filters only but plan to use the bluer filters for the lower z SNe, redder filters for the higher redshift ones

Z region	Z max	Area sq degrees	Exposure Time	Filters Used			
Low	0.5	9.00	200	1 – 2 - 3			
Mid	0.8	3.24	2400	2 – 3 - 4			
High	1.2	1.44	6000	3 – 4 - 5			

Translating Filter Bands to SNe Rest Frame

- Consider lightcurves in the bluest band at various redshifts
- Using 5 Filters, need a modest K correction

Supernova	Z	Bluest Filter	Rest Frame Band
SNE1	0.4	0.6 – 0.8	0.43 – 0.57
SNE2	0.8	0.8 – 1.0	0.44 -- 0.56
SNE3	1.2	1.0 – 1.28	0.45 – 0.58

- With only three filters available, need a HUGE K correction

Supernova	Z	Bluest Filter	Rest Frame Band
SNE1	0.4	1.0 – 1.28	0.71 – 0.91
SNE2	0.8	1.0 – 1.28	0.56 – 0.71
SNE3	1.2	1.0 – 1.28	0.45 – 0.58

Summary

- **Five Filters** are desirable to minimize reliance on K corrections (recall that SNAP proposed 8 or 9 filters!)
- With **three filters** will either have huge K corrections driving up the systematic errors or will have to restrict the SNe redshift range severely, either way lowering the Figure of Merit.