Total time required (in years of dark nights) for the supernova host survey from Najita et al. 2016 on various telescopes/instruments

Instrument / Telescope	Collecting Area (sq. m)	Field area (sq. arcmin)	Multiplex	Total time (dark-years)
4MOST	10.7	14,400	1,400	0.05
Mayall 4m / DESI	11.4	25,500	5,000	0.03
WHT / WEAVE	13.0	11,300	1,000	0.06
Subaru / PFS	53.0	4,500	2,400	0.04
VLT / MOONS	58.2	500	500	0.29
Keck / DEIMOS	76.0	54	150	2.04
Keck / FOBOS	76.0	314	1,800	0.35
ESO SpecTel	87.9	17,676	3,333	0.01
MSE	97.6	6,359	3,249	0.01
GMT/MANIFEST + GMACS	368.0	314	420	0.07
TMT / WFOS	655.0	25	100	0.51
E-ELT / Mosaic Optical	978.0	39	200	0.22
E-ELT / MOSAIC NIR	978.0	46	100	0.19

Updated from Newman et al. 2015, *Spectroscopic Needs for Imaging Dark Energy Experiments.* See following slides for details.

For E-ELT, both optical + NIR settings are required to meet required wavelength coverage.

A basic LSST supernova host survey design was presented in Najita et al. 2015, Maximizing Science in the Era of LSST: A Community-Based Study of Needed US Capabilities

- **Annual spectroscopy of ~100 new *r*<24 galaxy hosts of supernovae per deg^2 spanning 5 LSST deep drilling fields (10 sq. deg. each)**
  - **Assumed exposure time of ~8 hours per pointing on 4m**
    - **Corresponds to the S/N of DEEP2 spectroscopy**
      - **1 hour exposure time on Keck/DEIMOS yielded ~75% redshift success rates at *r=24* in DEEP2**
- **Supernova hosts that fail to yield redshifts can be retargeted in successive years, as in OzDES**
- **Provides redshifts for most of the ~50,000 best-characterized LSST SN Ia**
- **Other transients/hosts could be observed on remaining fibers; instruments considered on the previous slide can target 300-20,000 objects per sq. deg. total**

Assumptions made for survey time calculations

- Time requirements are given in years' worth of dark nights (365 dark nights = 1 dark-year). All open-shutter time is assumed to be dark time, as this will generally be required to detect rest-UV features at faint magnitudes, an important factor at $z \gtrsim 1.5$.
- Average losses of time due to instrumental effects, weather and overheads are assumed to be one-third in total. Dark nights are assumed to average 8 hours of total observation time each (so 5 1/3 hours after overheads + weather) to account for somewhat-grey nights with partial moon.
- All instrumental efficiencies are assumed to be identical; differences between instruments in seeing/image quality and fiber/slitlet size are ignored.
- An equivalent number of photons will yield equal noise (so that exposure time required to reach a given S/N varies inversely with aperture area)
- Only medium-resolution fibers are included in calculations (e.g., for MSE)
- Full spectral range can be covered simultaneously (likely not true for E-ELT, for which the separate breakdown per instrument is given).
- These effects could easily lead to a factor of two variations about these estimates.
- For details of calculation procedures see Newman et al. 2015, *Spectroscopic Needs for Imaging Dark Energy Experiments,* https://ui.adsabs.harvard.edu/#abs/2015APh....63...81N/abstract