Next Generation Palomar Spectrograph

3 way slicer, VPH gratings, 4 channels, automation

➔ *High throughput, resolution and efficiency*

Band[1]	λ (Å)	R=λ/δλ @ λ_{center}[2]	Line FWHM (Å)	Å/pix	Throughput NGPS[3]	Throughput DBSP[3,4]	Slit Efficiency[5] NGPS	Slit Efficiency[5] DBSP
U	3600 – 4340	4302	0.92	0.31	64%	21%	82%	36%
G	4340 – 5810	4001	1.27	0.42	62%	19%	80%	35%
R	5810 – 7820	3988	1.71	0.57	75%	23%	77%	33%
I	7560 – 10400	4281	2.08	0.69	73%	16%	75%	31%

1. Bands include contributions from overlapping channels.
2. Calculations assume 0.56" slit width (slice width for NGPS) and 1.3" seeing.
3. Mean throughput; does not include telescope, atmospheric transmission efficiency or slit loss factor.
4. Newly measured DBSP values after red side CCD upgrades. I-band throughput has improved.
5. 1 minus slit loss at band center, including any slicer reflection losses.

Three Example Cases

Bright star with narrow slices for high resolution.

High SNR faint limits for a point source at medium and low resolution.

1.3" seeing with sky background 20.3 mag/arcsec^2 at 6204Å.

Mag(r) (AB)	Slice width (")[1]	Slit loss[2]	R=λ/δλ @ λ_{center}	Å/pix	SNR per pix[3]	Exp. Time[4] (sec)	Exp. Time (sec) No slicer
15	0.37[5]	40%	5981	0.57	100	556	1365
20.5	0.56	22%	3988	0.57	5	1541	2580
20.5	1.13	4%	1329	0.57	5	1363	1544

1. Width per slice sets resolution. Light is collected from 3 times this width. Spectra from side slices are combined with central slice with weighting.
2. Slit loss includes losses from slicer optics.
3. Signal-to-Noise Ratio is per pixel along dispersion direction. SNR is fixed for calculation.
4. Exposure time calculation; assumes source at zenith.
5. Slice width = 0.37" maps FWHM of line to 2 pixels (Nyquist sampling). Narrower slice width with sub-pixel dithering of slit position will be supported.