

NICE (Near-Infrared Cross-dispersed Echelle spectrograph) is a near-infrared echelle spectrograph, which covers the wavelength range from 0.9 to 2.5  $\mu\text{m}$  with four exposures and has a wavelength resolution of  $\lambda/\Delta\lambda \sim 2600$  (in the case of 0.5" slit width with the TAO telescope).

For more information, please visit our website ([http://www3.iaa.s.u-tokyo.ac.jp/TAO/nice/NICE\\_HP/](http://www3.iaa.s.u-tokyo.ac.jp/TAO/nice/NICE_HP/)).



## Specifications

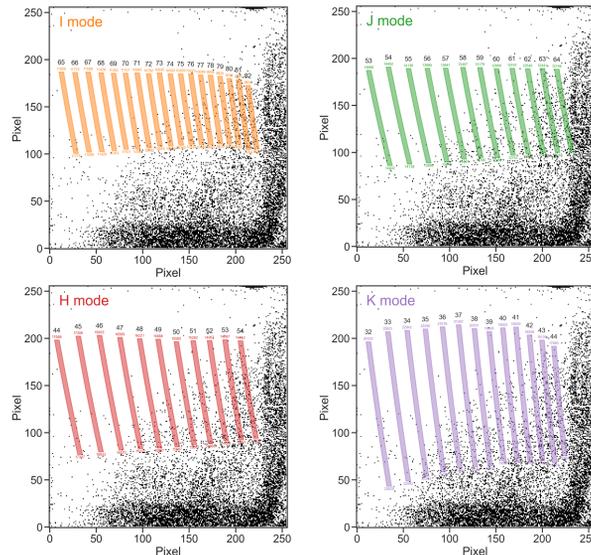
The table below summarizes the values of each parameter when NICE is mounted on the TAO telescope, where SPEC stands for spectral mode and IMG for imaging mode.

Parameter	I	J	H	K
Wavelength	0.95–1.20 $\mu\text{m}$	1.17–1.47 $\mu\text{m}$	1.41–1.78 $\mu\text{m}$	1.73–2.45 $\mu\text{m}$
Slit Width (dispersion)	0.5" or 1.0" or 1.5"			
Slit Length (spacial)	1.5"			
Resolution	$\sim 2600$ (0.5") or $\sim 1700$ (1.0") or $\sim 1600$ (1.5")			
Limiting Magnitude†	16.5	16.4	15.6	15.2
Detector	NICMOS-3 (256 x 256 pixels, 6.25 $\mu\text{m}/\text{pixel}$ )			
Pixel Scale	0.32"/pixel			
Filter	IJ (SPEC), HK (SPEC), J (IMG), H (IMG), Ks (IMG)			
Field of View (IMG)	50.26" x 50.26"			
Spacial Resolution (IMG)	0.20"/pixel			

† Limiting magnitudes are in Vega system, calculated by assuming a point source with flat SED, 600 sec integration,  $S/N = 10 \text{ pixel}^{-1}$  (w/o binning), 0.5" x 1.5" slit, and seeing = 0.7".

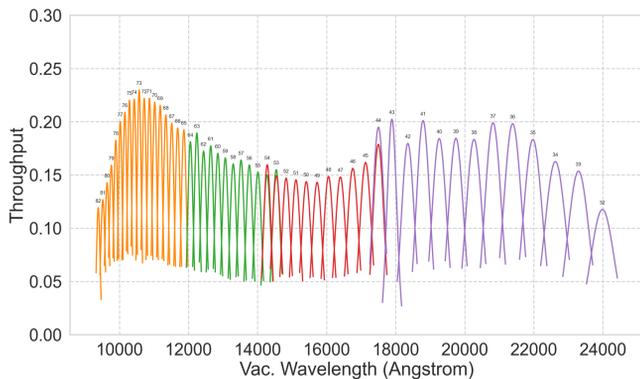
## Echelle formats

The figure below shows the echelle format for each mode. The black dots in the background represent bad pixels. Optionally, the echelle format can be shifted horizontally to reduce the effect of bad pixels in a specific wavelength range.



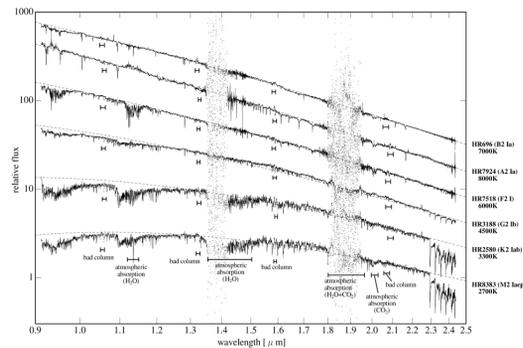
## System throughput

The figure below shows system throughput measured in the laboratory using a blackbody furnace. In actual observations, atmospheric transmission, telescope efficiency, and slit loss are added to this.



## Examples of spectra

The figure below shows spectra of B to M-type stars obtained with NICE on board the 1.5-m telescope in Japan between 2002 and 2004 (Yamamuro et al. 2007, Fig. 10). Note that the number of bad columns will increase from this figure due to the current increase in bad pixels.



## S/N vs. Integration Time

The figure below shows an estimate of the sensitivity in the Y, J, H, and Ks bands when NICE is installed on the TAO telescope. S/N per pixel (without binning) is plotted as a function of integration time for several Vega magnitudes. In the calculation, a point source with flat SED, 0.5" x 1.5" slit, and seeing = 0.7" are assumed. These are estimates and there is no guarantee that such values will be achieved.

