

VI. Analysis

4. 2MASS Photometric System

a. Absolute Calibration

2MASS photometry is quoted in the internal 2MASS photometric system. Conversions between the 2MASS and other popular near-infrared photometric systems were derived empirically by [Carpenter et al. \(2001, AJ, 121, 2851\)](#) using point source photometry from the 2MASS Second Incremental Data Release. Those transformations have been updated using the All-Sky Release PSC and are presented in [VI.4b](#).

2MASS Survey observations did not enable a direct measurement of the absolute calibration of the 2MASS photometric system. [Cohen et al. \(2003, AJ, 126, 1090\)](#) have determined photon-counting relative spectral response curves (RSRs) for the 2MASS system by combining the transmission and QE curves provided in [Section III.1.b1](#). Figures [1](#), [2](#), and [3](#) show these RSRs, with peaks renormalized to unity, and including atmospheric transmission as modeled by [PLEXUS](#). These authors offer an absolute flux calibration for 2MASS based on the calibrated spectrum of Vega from [Cohen et al. \(1992 AJ, 104, 1650\)](#). Characteristic quantum efficiency curves for the NICMOS III detectors supplied by Rockwell were used in the computation, but have not been measured explicitly for each device in the 2MASS cameras.

The isophotal wavelengths, bandpasses, and fluxes for zero magnitude for the three 2MASS bands from [Cohen et al. \(2003\)](#) are listed in Table 1 below. Figures [21](#) and [22](#) in [Section III.1.b1](#) show how the 2MASS J-band system response changes slightly with varying levels of atmospheric water vapor or atmospheric aerosols. The J-band values in Table 1 correspond to about 5.0 mm of water vapor, but are based on PLEXUS calculations, rather than the simpler ATRAN results shown in Figures [21](#) and [22](#) in [III.3.b1](#).

Table 1 - 2MASS Isophotal Bandpasses and Fluxes-for-0-magnitude from [Cohen et al. \(2003\)](#)

Band	Lambda (μm)	Bandwidth (μm)	Fnu - 0 mag (Jy)	Flambda - 0 mag ($\text{W cm}^{-2} \mu\text{m}^{-1}$)
J	1.235 ± 0.006	0.162 ± 0.001	1594 ± 27.8	$3.129\text{E-}13 \pm 5.464\text{E-}15$
H	1.662 ± 0.009	0.251 ± 0.002	1024 ± 20.0	$1.133\text{E-}13 \pm 2.212\text{E-}15$
K _s	2.159 ± 0.011	0.262 ± 0.002	666.7 ± 12.6	$4.283\text{E-}14 \pm 8.053\text{E-}16$

Figures [1](#), [2](#), and [3](#) present the 2MASS J, H and K_s relative spectral response curves (RSRs), peak-normalized to unity, derived by [Cohen et al. \(2003\)](#). As stated by these authors, these curves "*are designed to be integrated directly over stellar spectra in F_λ form, in order to calculate synthetic photometric magnitudes. The QE-based component was converted to yield photon-counting RSRs by multiplying by wavelength and renormalized, as described by [Bessel \(2000\)](#).*" These RSRs are consistent with the absolute calibration of 2MASS given in Table 1 above.

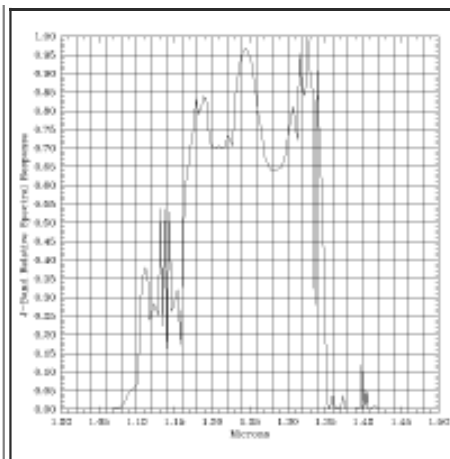


Figure 1
J band RSR

[Data table](#)

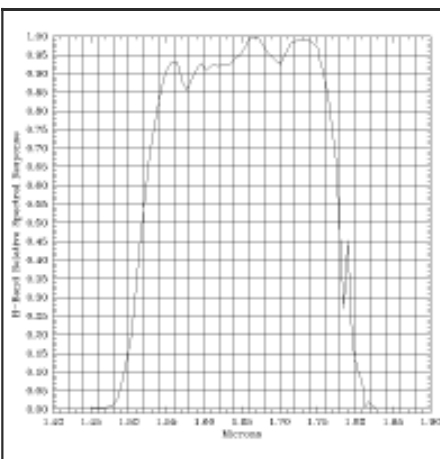


Figure 2
H band RSR

[Data table](#)

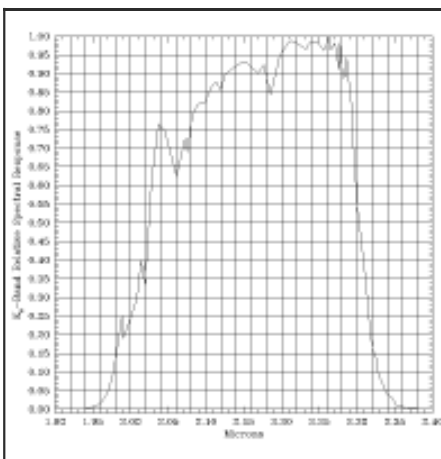


Figure 3
K_s band RSR

[Data table](#)

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