

7 Appendices

7.1 Infrared Flux Units

The infrared flux density from a point source is most commonly given in units of Jansky (Jy) where:

$$1 \text{ Jy} = 10^{-23} \text{ erg s}^{-1} \text{ cm}^{-2} \text{ Hz}^{-1} = 10^{-26} \text{ Watts m}^{-2} \text{ Hz}^{-1} = F_\nu \quad (10.1)$$

The conversion between Janskys and flux density in W m^{-2} per unit wavelength is given by:

$$F_\nu \times 10^{-26} \times c / \lambda^2 = F_\lambda \quad (10.2)$$

The infrared flux density from an area on the sky, such as the surface brightness of an extended object, or the background emission, is commonly given in $10^6 \text{ Jy steradian}^{-1} = 1 \text{ MJy sr}^{-1}$. Another common unit is Jy per square arcsecond; $1 \text{ MJy sr}^{-1} = 2.350443 \times 10^{-5} \text{ Jy arcsec}^{-2}$.

Table 7.1–Table 7.4 list the zero magnitude fluxes for various common optical and infrared filters. Note that the photometric system of filter sets can vary, depending on the manufacturer. The magnitude of a source can be converted to a flux density using:

$$F_\nu = F_0 \times 10^{(-m/2.5)} \quad (10.3)$$

There is an on-line Javascript tool available from the SSC website that interactively converts Janskys to magnitudes (or any of a variety of flux units) and vice versa.

Table 7.1: 2MASS system zero points

Passband	Effective wavelength (μm)	Zero point (Jy)
J	1.235	1594
H	1.662	1024
Ks	2.159	666.7

References: Table 2 from Cohen, Wheaton, & Megeath 2003, AJ, 126, 1090; see also 2MASS All-Sky data release web document, <http://www.ipac.caltech.edu/2mass/releases/allsky/doc/explsup.html>.

Table 7.2: Johnson system zero points

Passband	Effective wavelength (μm)	Zero point (Jy)
U	0.36	1823
B	0.44	4130
V	0.55	3781
R	0.71	2941
I	0.97	2635
J	1.25	1603
H	1.60	1075
K	2.22	667
L	3.54	288
M	4.80	170
N	10.6	36
O	21.0	9.4

References: Allen's Astrophysical Quantities, Fourth edition, 2001, Arthur N. Cox (ed.), Springer-Verlag; Campins, Rieke, & Lebofsky 1985, AJ, 90, 896; Rieke, Lebofsky, & Low 1985, AJ, 90, 900.

Table 7.3: UKIRT system zero points

Passband	Effective wavelength (μm)	Zeropoint (Jy)
V	0.5556	3540
I	0.9	2250
J	1.25	1600
H	1.65	1020
K	2.20	657
L	3.45	2.90
L'	3.80	2.52
M	4.8	163
N	10.1	39.8
Q	20.0	10.4

References: UKIRT web page:
<http://www.jach.hawaii.edu/JACpublic/UKIRT/astronomy/conver.html>

Table 7.4: MIRLIN zero points

Passband	Effective wavelength (μm)	Zeropoint (Jy)
K	2.2	650.0
M	4.68	165.0
N	10.79	33.4
Qs	17.90	12.4
N0	7.91	60.9
N1	8.81	49.4
N2	9.69	41.1
N3	10.27	36.7
N4	11.70	28.5
N5	12.49	25.1
Q0	17.20	13.4
Q1	17.93	12.3
Q2	18.64	11.4
Q3	20.81	9.2
Q4	22.81	7.7
Q5	24.48	6.7

References: MIRLIN web page (<http://cougar.jpl.nasa.gov/MIRLIN/filters.html>)

7.2 Infrared Backgrounds

Various astronomical sources emit radiation in the infrared part of the spectrum. Cool stars (M class) have their peak emission just short of the near infrared. However, stars with dusty envelopes or shells and circumstellar disks can be quite bright in the infrared. Regions of star formation, HII regions, and planetary nebulae are strong infrared sources. The (relatively) cool interstellar medium in galaxies has an infrared component. There are also ultra-luminous infrared bright galaxies that are very strong sources of infrared radiation.

As in the optical, the infrared zody is concentrated toward the ecliptic with weaker emission, by approximately a factor of 4, toward the ecliptic poles. The infrared zody is strongest from about 5 μm to about 30 μm with peak emission at about 10 μm . The infrared zody has structure on most scales and, as observed from Earth, varies from season to season. The intensity of the infrared zody will also vary with solar elongation, or how close to the Sun one is pointed. The infrared zody is difficult to model.

As one moves to longer wavelengths ($\geq 100 \mu\text{m}$), diffuse Galactic emission from dust clouds in the interstellar medium becomes the dominant contribution to the infrared background. This infrared cirrus is patchy, with higher concentrations found in the Galactic disk and toward the Galactic center. However, it is

important to realize that the cirrus is ubiquitous, and it is critical to examine the IRAS maps or radio maps of cirrus tracers when planning longer-wavelength observing. Far-infrared emission from external galaxies in the field of view will add to the overall background flux.

For more information on infrared backgrounds, see the “Backgrounds” section of the Infrared Compendium, available on the SSC web pages.

7.3 Solar System Objects Included in Bright Object Avoidance

Also see the list of bright inertial objects on the SSC website.

- Earth
- Moon
- Mars
- Jupiter
- Saturn
- Uranus
- Neptune
- 4 Vesta
- 6 Hebe
- 1 Ceres
- 7 Iris
- 15 Eunomia

8 Acronyms/Glossary

Note: The following lists the acronyms used in this manual. A larger list of acronyms is available on the SSC website, <http://ssc.spitzer.caltech.edu/>.

Table 8.1: Acronyms used in this manual

ADC	Analog to Digital Converter
ADU	Analog to Digital Units
AOR	Astronomical Observation Request(s)
AOT	Astronomical Observation Template(s)
BCD	Basic Calibrated Data
BIB	Blocked Impurity Band
C&DH	Command and Data Handling
CA	Cryogenic Assembly
CE	Combined Electronics
CIB	Cold Interface Board
CMOS	Complementary Metal-Oxide Semiconductor
CP	Call for Proposals
CR	Cosmic Ray
CSE	Control Section Electronics
CSFS	Control Section Flight Software
CSMM	Cryogenic Scan Mirror Mechanism (MIPS scan mirror)
CTA	Cryogenic Telescope Assembly
CTIA	Capacitive TransImpedance Amplifier
DAC	Digital to Analog Converter
DCE	Data Collection Event
DCS	Double Correlated Sampling
Dec	Declination
DN	Data Number
DQE	Detector Quantum Efficiency
DSN	Deep Space Network
EDAC	Error Detection and Correction
EEPROM	Electrically Erasable Programmable Read Only Memory
FAQ	Frequently Asked Question
FITS	Flexible Image Transport System
FLS	First Look Survey
FOV	Field-of-View
FPA	Focal Plane Array
FPMA	Focal Plane Mount Array
FWHM	Full Width at Half Maximum
GSFC	Goddard Space Flight Center
GO	General Observer(s)
GTO	Guaranteed Time Observer(s)
HGA	High Gain Antenna
HST	Hubble Space Telescope
IBC	Impurity Band Conduction

ICRS	International Celestial Reference System
IER	Instrument Engineering Request – like an AOR, but for specific engineering tasks not able to be accomplished using an AOR.
IOC	In-Orbit Check out
IPAC	Infrared Processing and Analysis Center
IR	Infrared
IRAC	InfraRed Array Camera
IRAS	InfraRed Astronomical Satellite
IRS	InfraRed Spectrograph
IRU	Inertial Reference Unit
ISO	Infrared Space Observatory
ISSA	IRAS Sky Survey Atlas
Jy	Jansky
LGA	Low Gain Antennae
LIRG	Luminous InfraRed Galaxy
MIC	Multi-Instrument Chamber
MIPS	Multiband Imaging Photometer for Spitzer
mJy	milliJansky
MJy	megaJansky
MPC	Minor Planet Center
MUX	Multiplexer
OPZ	Operational Pointing Zone
PAO	Period of Autonomous Operations
PCRS	Pointing Control Reference Sensor
PCS	Pointing & Control System
PIN	Positive Intrinsic Negative (Diode)
PM	Primary Mirror
PRF	Point Response Function (like a PSF, but having been transmitted through the telescope+instrument optics)
PSF	Point Spread Function
PSSC	Point Source Sensitivity - Continuum
PSSL	Point Source Sensitivity - Line
PST	Point Source Transmission
PUI	Peak-Up Imaging
RA	Right Ascension
RAM	Random Access Memory
RCS	Reaction Control System
rms	Root Mean Square
SAO	Smithsonian Astrophysical Observatory
SBRC	Santa Barbara Research Center
S/C	SpaceCraft
SED	Spectral Energy Distribution
SIRTF	Space InfraRed Telescope Facility, Spitzer's old name
SLO	Second-Look Observation
SM	Secondary Mirror

SODB	Science Operations Database
SOM	Spitzer Observer's Manual
S/N	Signal to Noise
Spot	Previously listed here as an acronym meaning "Spitzer Planning Observations Tool" but now it is simply a proper noun
sr	Steradians
SSC	Spitzer Science Center
SSC website	http://ssc.spitzer.caltech.edu/
SSO	Solar System Objects/Observations
ST	Star Tracker
ST/IRU	Star Tracker/Inertial Reference Unit
TAC	Time Allocation Committee
ToO	Target of Opportunity
TPG	Time Pattern Generator
TP, TPM	Total Power Mode
QE	Quantum Efficiency
WASS	Wide Angle Sun Sensor
WEA	Warm Electronics Assembly

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