

## Conversions of Intensity Scales and Frequency Units

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- One can change the axis **labeling** in SpectrumExplorer:
  - add an auxiliary x-axis
  - alter that axis: micron, wavenumber, velocity, etc., but also HIFIspecific USB, LSB, IF
- One can change the actual units in the product or spectrumdataset:
  - convertWavescale(ds=spectrum, to="micrometer")
    - Velocity, frequency, wavelength, wavenumber units
- Specifically for HIFI Timeline Products or HIFI Spectral Data Sets:
  - ConvertFrequencyTask
  - USB, LSB, IF and Velocity
  - For velocity, supply reference frequency and sideband
  - see HIFI Data Reduction Guide Chapter 15.1







- HIFI-specific HIPE task ConvertK2Jy
- Operates on ObsContext, HIFI Timeline Product, SpectrumDataSet, or SimpleSpectrum
- Converts "brightness temperature" [K] to Jy in the Rayleigh Jeans approximation
- Converts from TA\* or TMB to Jy:
  - applying eta\_MB if necessary
  - needs source size as input (diameter in arcsec):
    - Set to 0.0 for point sources

Gets effective aperture and beam efficiencies from HIFI cal tree. If no cal tree is available, parameters are estimated from standard relations.







General IPAC unit conversion tool, can be run in two different ways:

•within HIPE as a plugin: Tools -> Plugins

• from website: nhscdmz4.ipac.caltech.edu:8081/conversions/

Converts:

- Flux
- Flux Density
- Intensity
- Integrated Intensity
- Encircled Area

Includes Help Files







## General IPAC unit conversion tool

$\mathbf{O}$	Unit Conversion Tool					
Help						
		Flux Flux Density	Intensity & T_B	Integrated Intensity	Encircled Area	
	Input					
	Central Wavelength or Frequency 809.3432 Freque				equency [GHz]	¢
	103.4e	•6		Intensity [Jy/s	r]	¢
	Output					
	+5.137779e-03				0	
convert		Intensity [Jy/sr] Intensity [W/m^2/um/sr] Intensity [erg/s/cm^2/Hz/sr]				
				Intensity [erg/ Intensity [K]	s/cm^2/um/sr]	
	Help	Input Central 103.4e Output +5.13	Flux Flux Density   Input Central Wavelength or Frequence   103.4e6 Output   +5.137779e-03	Help Flux Flux Density Intensity & T_B Input Central Wavelength or Frequency 809.343 103.4e6 Output +5.137779e-03	Help Flux Flux Density Intensity & T_B Integrated Intensity Input Central Wavelength or Frequency 809.3432 Fre 103.4e6 Intensity [Jy/s Output +5.137779e-03 ✓ Intensity [W/m Intensity [W/m Intensity [W/m Intensity [W/m Intensity [W/m Intensity [W/m Intensity [W/m Intensity [eg/]	Help Flux Flux Density Intensity & T_B Integrated Intensity Encircled Area Input Central Wavelength or Frequency 809.3432 Frequency [GHz] 103.4e6 Intensity [Jy/sr] Output +5.137779e-03 ✓ Intensity [W/m^2/Hz/sr] Intensity [W/m^2/um/sr] Intensity [eg/s/cm^2/Hz/sr] Intensity [eg/s/cm^2/um/sr]

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Table Of Contents	< derived	I
Unit Conversion Tool Help	Integrated Intensity Conversion factors	
Unit Conversion Tool	Consider the Integrated Intensity units:	
Download PDF	1. $W/m^2/sr$	
	2. $\overline{W/cm^2/sr}$	
	a, erg/s/cm <sup>2</sup> /sr	Ì
	4. K km/s	
	5. K MHz	
		1
	With $\nu$ in $GHz$ , to get, e.g. from unit 1 to 2, multiply by	1
	• $1 - > 2 \frac{10^{-4}}{4}$	1
	• 2->1 <u>10</u> <sup>4</sup>	I
	• $1 - > 3 \frac{10^3}{10^{-3}}$ • $3 - > 1 \frac{10^{-3}}{10^{-3}}$	l
	• $3 - > 1 \frac{10^{-3}}{3}$	

900	Unit Conversion Tool					
File Help						
	Flux Flux Density Intensity & T_B	Integrated Intensity Encircled Area				
	Input					
	Central Wavelength or Frequency 158	Wavelength [um]				
	1.6e-16	Flux Density [W/cm^2/um]     Flux Density [Jy]     ✓ Flux Density [mly]     Flux Density [W/cm^2/Hz]     Flux Density [erg/s/cm^2/Hz]     Flux Density [W/cm^2/um]     Flux Density [W/m^2/um]				
	Output					
	+1.332335e+00					
	convert					
		Flux Density [erg/s/cm^2/um] Flux Density [erg/s/m^2/um]				







WATER