In [148]:

```
# To do this for Jupiter, need to calculate temperature of Jupiter using radiati
T_Jup_Sun = EquilTemp(5.2*u.au,0.34)
T_Jup_A0 = EquilTemp(5.2*u.au,0.34,Rstar=2.09*const.R_sun,Teff=9700*u.K)

# Create instance of SED class for Jupiter
SED_Jup = SED('freq','planck',Teff=T_Jup_Sun.value)
SED_Jup_A0 = SED('freq','planck',Teff=T_Jup_A0.value)

# Calculate fluxes over bandpasses for Sun-like star
Kepler_flux_Jup = SED_Jup.ResponseFunction(Kepler_freq,Kepler_effic)
Spitzer_flux_Jup = SED_Jup.ResponseFunction(Spitzer_freq,Spitzer_effic)

# Calculate fluxes over bandpasses for A0V star
Kepler_flux_Jup_A0 = SED_Jup_A0.ResponseFunction(Kepler_freq,Kepler_effic)
Spitzer_flux_Jup_A0 = SED_Jup_A0.ResponseFunction(Spitzer_freq,Spitzer_effic)

# Calculate magnitude differences for Jupiter
delta_m_Jup_Sun = MagDiff(Kepler_flux_Jup,Spitzer_flux_Jup)
delta_m_Jup_A0 = MagDiff(Kepler_flux_Jup_A0,Spitzer_flux_Jup_A0)
delta_m_Jup = delta_m_Jup_Sun-delta_m_Jup_A0
print("My calculated V-W2 color for a super Jupiter is {0:.3f}".format(delta_m_J
```

```
Apparent magnitude difference = 119.215
Apparent magnitude difference = 48.046
My calculated V-W2 color for a super Jupiter is 71.169
```

**There is almost 2 orders-of-magnitude difference between the star and super Jupiter's apparent magnitudes. Requires precise observations to detect the planet!**

## 2) Maxwell-Boltzmann Distributions

### 2a) Plot a Maxwell-Boltzmann distribution of speeds for He in the Earth's atmosphere. Integrate this distribution between the $v_{esc}$ for Earth and $v = \infty$ to find what fraction of He atoms at any given time have speeds greater than escape velocity. Do the same for molecular nitrogen and compare fractions