Photometry exercises

1. Formulate a formula which expresses which fraction of photons emitted by a star are registered on the detector. Assume that the photons have wavelength lambda and travel through ISM,atmosphere, two mirrors, a filter and then hit the detector.

   Photons_det/photons_emi=f_ism*f_atm*f_mir^2*f_fil*f_det

2. Compute an actual fraction for a chosen wavelength and some typical numbers for the other components.

   Taking ~5500Ang (V-band) for lambda.
   Typical ISM: A_V=0.1: f_ism=10^(-0.1/2.5)
   Atmosphere: LaPalma: dmag=0.13*airmass=0.13: f_atm=10^(-0.13/2.5)
   Mirrors: f_mir=0.9 (see lecture slides)
   Typical filter: f_filter=0.88 (e.g., http://catserver.ing.iac.es/filter/list.php?instrument=WFC&sort=passband)
   F_det=0.8 (see lecture slides)
   Ph_det/Ph_emi=0.46

3. What is the general formula to convert between AB and Vega magnitudes using Jansky as flux units (see lecture sheet below)?

   m_ab – m_vega= m(Vega)_ab

4. Find on the web conversion values between AB and Vega for SDSS observations.

   See e.g., http://www.sdss.org/dr6/algorithms/sdssUBVRITransform.html
   Assuming V=+0.03 and U-B = B-V = V-R_c = R_c-I_c = 0.00, we find for the A0V star Vega the following:

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g    = -0.08   (+/-0.03)
u-g  = +1.02   (+/-0.08)
g-r  = -0.25   (+/-0.03)
r-i  = -0.23   (+/-0.02)
i-z  = -0.17   (+/-0.02)
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