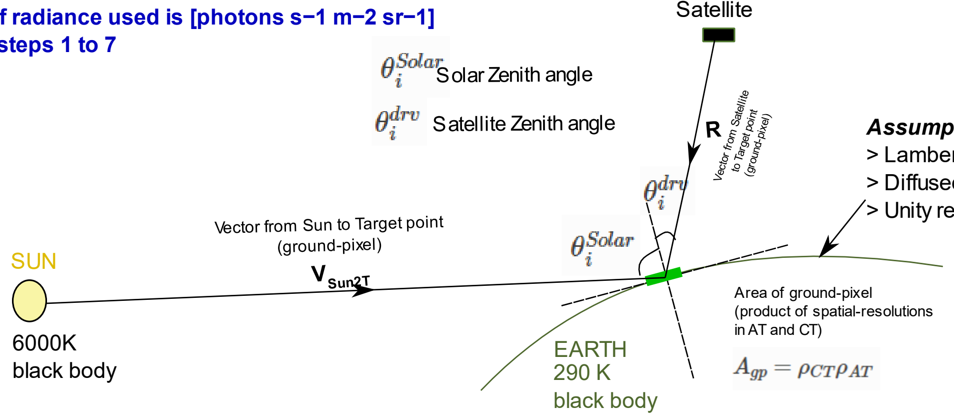
**The units of radiance used is [photons s−1 m−2 sr−1]**
**Follow the steps 1 to 7**




***Assumptions:***
> Lambertian surface
> Diffused reflection
> Unity reflectivity of surface

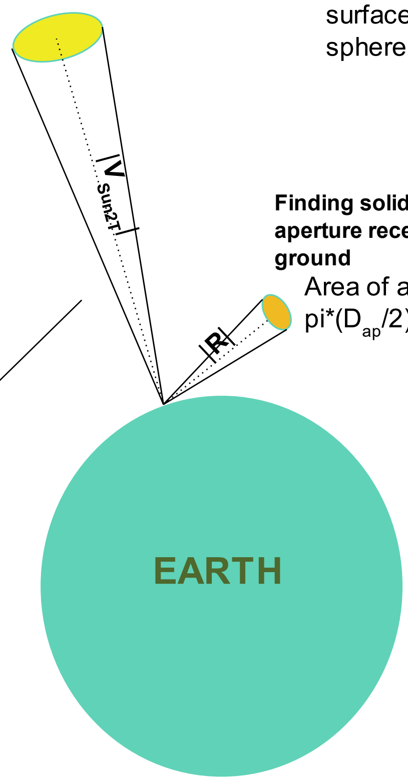
**Finding solid-angle at a point on Earth receiving photons from the Sun**

Area of solar disc:
pi*$r_{Solar}^{2}$

***Note:*** "disc" is on surface of (imaginary) sphere about the ground-point.

**Finding solid-angle the instrument aperture receiving photons from the ground**

Area of aperture:
pi*$(D_{ap}/2)^2$




**1.** Total radiance from Sun in spectral band

$$L_S = \int_{\lambda_1}^{\lambda_2} L_\lambda$$

***spectral*** radiance from Sun modelled as black-body at 6000 K

**2.** Calculate downwelling radiance towards the target point

$$L_S^{dw} = L_S \cos\theta_i^{Solar}$$

**3.** Calculate downwelling photon-rate

$$R_S^{dw}|_{ph} = L_S^{dw} A_{gp} \frac{\pi r_{Solar}^2}{|\mathbf{V_{Sun2T}}|^2}$$

Solid angle subtended by the Sun over the ground-point
$r_{Solar}$ is radius of Sun

**4.** Calculate upwelling photon rate towards direction of satellite

$$R_S^{uw}|_{ph} = R_S^{dw}|_{ph} \cos\theta_i^{drv}$$

Assumption of unit reflectivity of surface

Assumption of Lambertian

**5.** Calculate upwelling radiance towards direction of satellite

$$L_S^{uw} = \frac{R_S^{uw}|_{ph}}{4\pi A_{gp}}$$

Make per m2

Make per sr

**6.** Calculate upwelling photon rate towards direction of satellite

Radiance from Earth (modelled as black-body at 290K)

$$L_T = L_E + L_S^{uw}$$

Calculate over the entire ground-pixel area

$$R_T^{rad}|_{ph} = L_T A_{gp}$$

Calculate over the entire solid-angle subtended by instrument aperture

$$R_T^{sen}|_{ph} = \frac{R_T^{rad}|_{ph}}{|\mathbf{R}|^2}\left(\frac{D_{ap}}{2}\right)^2\pi$$

**R**: Distance from satellite to ground-pixel
$D_{ap}$: diameter of instrument aperture

**7.** Calculate signal electrons acquired

$$R_T^{det}|_{ph} = R_T^{sen}|_{ph}\tau_{op}$$

effiency of the optical system (aperture to Focal-plane)

$$N_{ph} = R_T^{det}|_{ph} T_i$$

Integration time

$$N_e = N_{ph} Q_E$$

Quantum efficiency
i.e. efficiency of photon to electron conversion at the detector on Focal plane