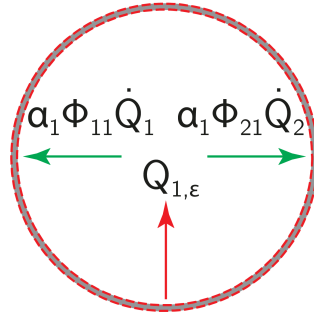


EB - Rad. - Inner 06

Write the inner energy balance for object 1 being in thermal equilibrium. Use view factors and surface brightness whenever possible.



Energy balance:

$$\frac{\partial U}{\partial t} = \sum \dot{Q}_{\text{in}} - \sum \dot{Q}_{\text{out}}$$

$$0 = \alpha_1 \left(\Phi_{11} \dot{Q}_1 + \Phi_{21} \dot{Q}_2 \right) - \dot{Q}_{1,\epsilon}$$

Heat fluxes:

The surface brightnesses of bodies 1 and 2 will be determined in a separate task and can be stated as \dot{Q}_1 and \dot{Q}_2 respectively.

The emitted radiation of body 1 by use of the emission coefficient and the Stefan-Boltzmann law:

$$\dot{Q}_{1,\epsilon} = \epsilon_1 A_1 \sigma T_1^4$$

Substituting and rewriting:

$$0 = \alpha_1 \left(\Phi_{11} \dot{Q}_1 + \dot{Q}_2 \right) - \epsilon_1 A_1 \sigma T_1^4$$