

## Sheet 10 - Colors

Jan Scheffczyk - 3242317  
Leif Van Holland - 2563657  
Oliver Leuschner - 3205025

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### Assignment 3) Radiant Flux and Radiance

**a)** The area  $A_P$  of the parabolic object is exactly one quarter of the area  $A_S$  of the sphere with radius  $R = 1$ . For the flux  $\Phi_{e,P}$  through the parabolic object we get

$$\Phi_{e,P} = \Phi_e \cdot \frac{A_P}{A_S} = 8W \cdot \frac{A_S}{4 \cdot A_S} = 2W.$$

**b)** To get intensity  $I_e$  from radiance  $L_e$ , we have to integrate radiance over a differential surface area  $dA$  (instead of integrating over a differential solid angle). We can derive this relationship starting with the definition of radiance:

$$\begin{aligned} L_e &= \frac{d^2\Phi_e}{\cos\theta \cdot dA \cdot d\omega} \\ \Leftrightarrow \int_A L_e \cdot dA &= \frac{d\Phi_e}{\cos\theta \cdot d\omega} \\ \Leftrightarrow \int_A L_e \cdot \cos\theta \cdot dA &= \frac{d\Phi_e}{d\omega} =: I_e. \end{aligned}$$