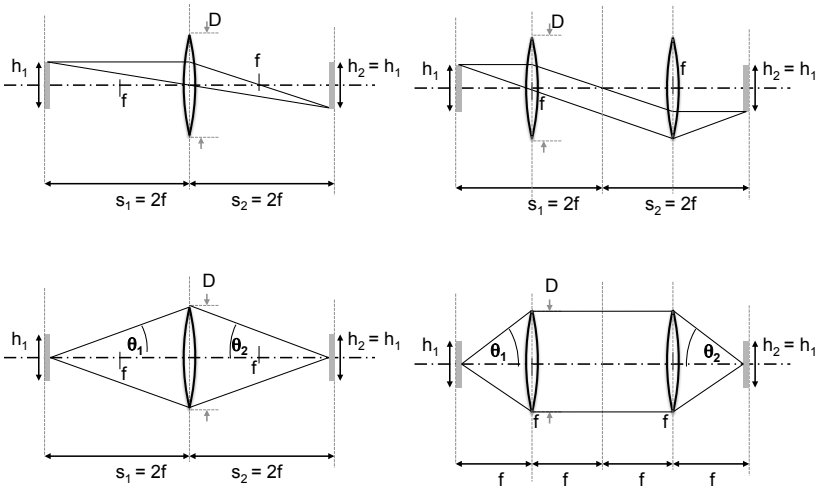
4f and infinity configuration.



Source

- Each source has a brightness B
- This is a quantity that is fixed!

$$B_{source} = \frac{P_{tot}}{A_{tot}\Omega_{tot}}$$

- In an optical system we accept only part of this , depending on the system parameters, acceptance (solid) angle Ω_{system} and surface A_{system}.
- The power in the system from our source is

$$P_{system} = B_{source}\, A_{system}\Omega_{system}$$

- In our case the surface A are the same in all cases and only the solid angle Ω_{system} changes.

Comparison

- We integrate the intensity over surface and get a power equivalent:

$$I = \frac{P_{system}}{A_{system}} \qquad P_{system} = \int I dA$$

- For the 4 system we have

$$P_{4f} = B_{source} A_{4f} \Omega_{4f}$$

- For the infinity system we have

$$P_{inf} = B_{source} A_{inf} \Omega_{inf}$$

- Comparing both gives

$$\frac{P_{inf}}{P_{4f}} = \frac{B_{source} A_{inf} \Omega_{inf}}{B_{source} A_{4f} \Omega_{4f}} = \frac{\Omega_{inf}}{\Omega_{4f}}$$

Influence of a source emission

- The source might not emit uniform in all directions. In such cases one needs to consider the power dependence on direction.
- LED has a pronounced dependence ($\cos\Phi$)

$$P_{source} = \int_{\Omega_{source}} P(\Phi) d\Phi$$

$$P_{system} = \int_{\Omega_{system}} P(\Phi) d\Phi$$