

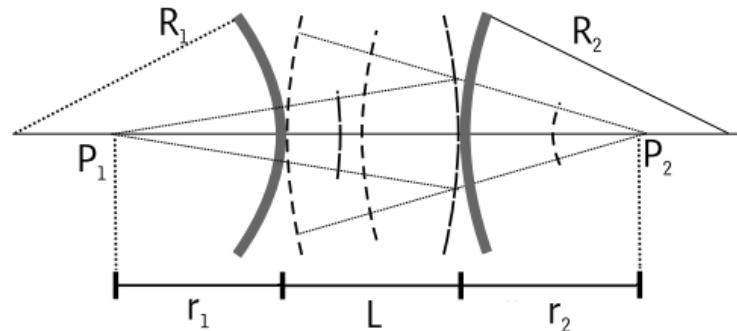
## Tasks on unstable optical resonators

### 1. Geometrical output coupling for double-ended unstable resonators.

Verify that even if an unstable optical resonator of overall round-trip magnification  $M$  has diffraction-coupled outputs past the edges of both end mirrors, the total round trip power loss is still given by the same formula which depends on the overall magnification  $M$  only.

### 2. Mode self-consistency with spherical wave analysis.

Derive the location of points  $P_1$  and  $P_2$  which satisfies mode self-consistency (express  $r_1$  and  $r_2$  through other geometrical parameters).



### 3. Short case study.

Imagine you need to build a laser for hard metal alloy cutting. Describe, which gain medium and resonator design you would prefer, and motivate.