

**Acoustics Exercise 5.** To be returned on Friday 24.4.2009

- (1) Calculate the transmission  $T$  and reflection  $R$  coefficients, defined in the lectures for a plane wave coming at an angle  $\theta$  in terms of the intensity of the incident, reflected and transmitted components.
- (2) Calculate, the acoustic resistance of long slit through a wall of thickness  $\ell$  at low frequencies

$$R_{slit} = \frac{12\ell\mu}{a^3b},$$

where  $\mu$  is to viscosity of air,  $a$  is the width of the slit, and  $b \gg a$  is the length of the slit. Use the quasistatic approximation.

- (3) Calculate the acoustic inductance of the same slit

$$L_{slit} = \frac{6\ell\rho}{5ab},$$

where  $\rho$  is the density of air.

- (4) Estimate the Helmholtz frequency of a standard beer bottle. Assume that it is a combination of an acoustical cavity and a tube constriction.
- (5) Make a lumped parameter model of a bass reflex loudspeaker. Explain its workings.