MR 513 Session 34 11/13/15

Homework Hints

6.2.2

water p_i ↓ ↑ p_r $\rho_w c_w$

bottom $Z_b = \rho_b c_b$

$$R = \frac{p_r}{p_i}$$

$$\underset{\approx}{R} = \frac{\zeta_{21} - 1}{\zeta_{21} + 1}$$

$$20 \log |R| = -20$$

$\underset{\approx}{|R|} \rightarrow$ (x)

+x

−x

~~6.?.?~~ 6.2.3

(a) ② air

① ↑ ↓ water $|R|^2$

(b) ↓ ① air

② water

$$T = \frac{2 \zeta_{21}}{\zeta_{21} + 1}$$ pressure transmission

$T_I =$ change in medium

6.2.6

$$R = \frac{r_2 - r_1}{r_2 + r_1}$$

$r_1 = \rho_1 c_1$

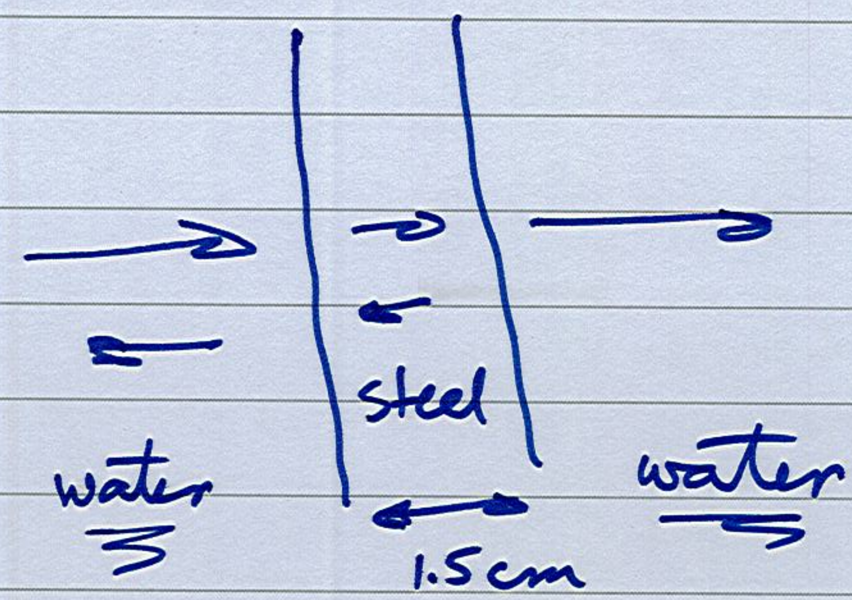
$r_2 = \rho_2 c_2$

$$= \frac{1 - \left(\frac{r_1}{r_2}\right)}{1 + \left(\frac{r_1}{r_2}\right)}$$

$$\frac{\rho_1 c_1}{\rho_2 c_2}$$

$$= \frac{1 - x}{1 + x}$$

6.3.3



(a) $\mathcal{T}_I$ 6.3.9 (c)

$$TL = 10 \log \frac{1}{\mathcal{T}_I}$$

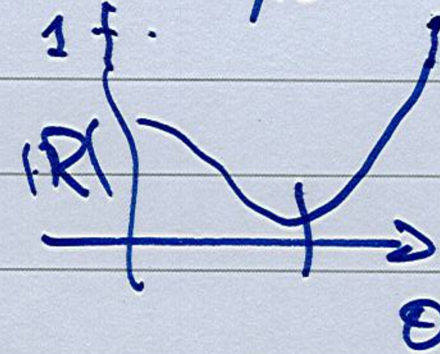
(b) $R =$ 6.3.7

$$R_I = |R|^2$$

6.6.1

$z_n = 900 - i1200$ Rayls

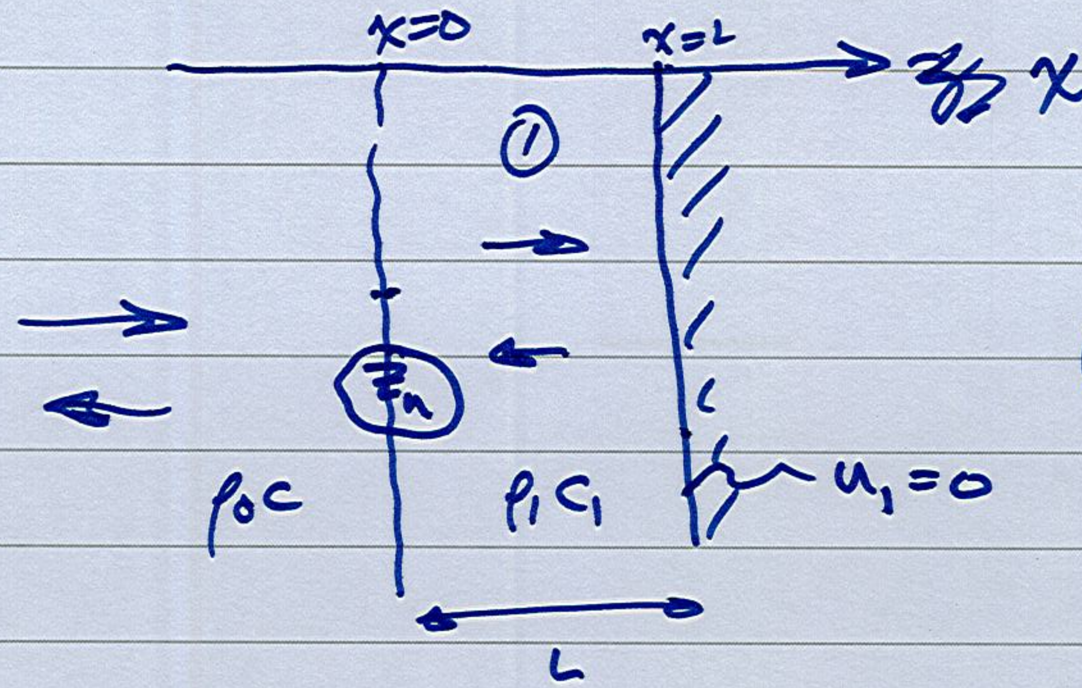
$$R = \frac{z_n \cos\theta - \rho_0 c}{z_n \cos\theta + \rho_0 c}$$



Find θ that minimizes $|R|^2$

$$\frac{\partial |R|^2}{\partial \theta} \rightarrow 0$$

$$|R|^2 = RR^*$$



$$\boxed{z_n} = \frac{p_{1\,surface}}{u_{1\,surface}}$$

$$= \frac{\cancel{A} \sim\sim}{\cancel{A} \sim\sim}$$

$$p_1 = A e^{-jk_1 x} + B e^{+jk_1 x}$$

u_1

$$u_1 \Big|_{hard\,surface}$$

$$R = \frac{z_n - \rho_0 c}{z_n + \rho_0 c} \qquad |R|^2 = 1$$

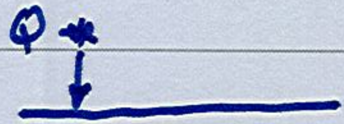
Sound power radiated by
an acoustic depends on
the environment

free space

Q *

W = 1

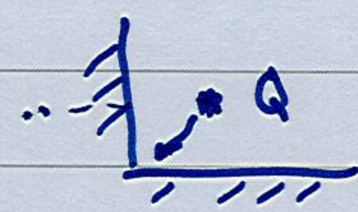
hard surface



1 image

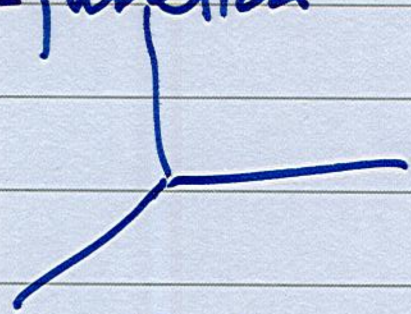
W = 2

1 junction



W = 4

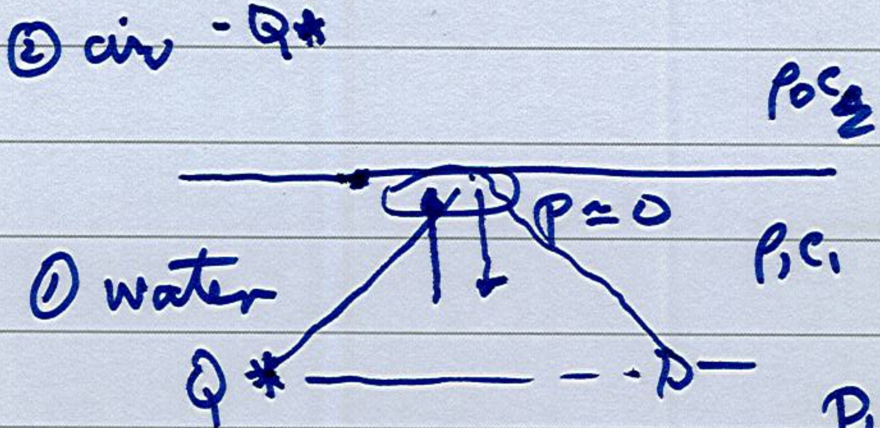
2 junction



7 images

W = 8

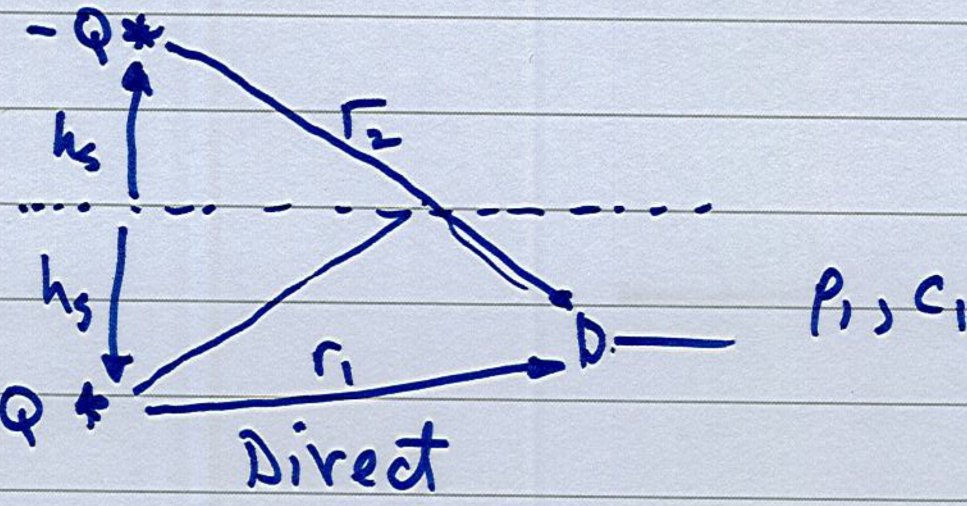
3.3.4.2 Pressure Release Surface

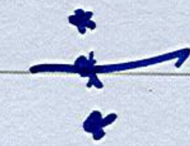


$p_1 \simeq 0$

$$R(\theta) = \frac{\zeta_{21} - 1}{\zeta_{21} + 1}$$

$$\zeta_{21} = \frac{\rho_0 c}{\rho_1 c_1}$$

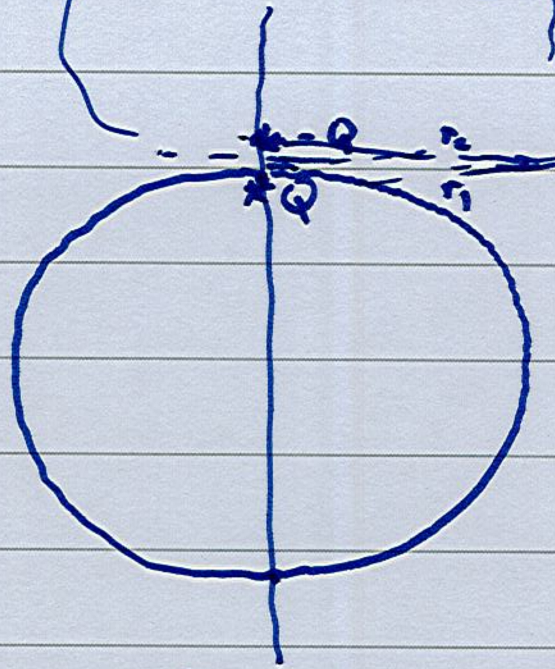




$$\tilde{p}(r) = A \left\{ \frac{e^{-jk_1 r_1}}{r_1} - \frac{e^{-jk_1 r_2}}{r_2} \right\}$$

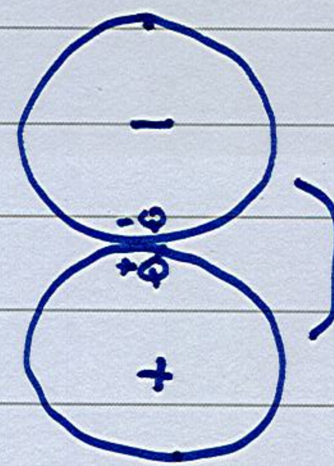
$$k_1 = \frac{\omega}{c_1}$$

Image is "out-of-phase" with the actual source let the source approach the surface



minimum in the sound radiation because of perfect cancellation of the ~~of the~~ direct + reflected signals

maximum radiation ⊥ to the surface

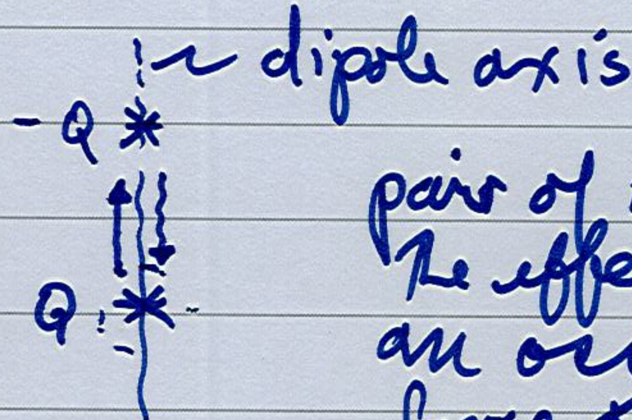


out-of-phase

figure of 8 directivity pattern

11

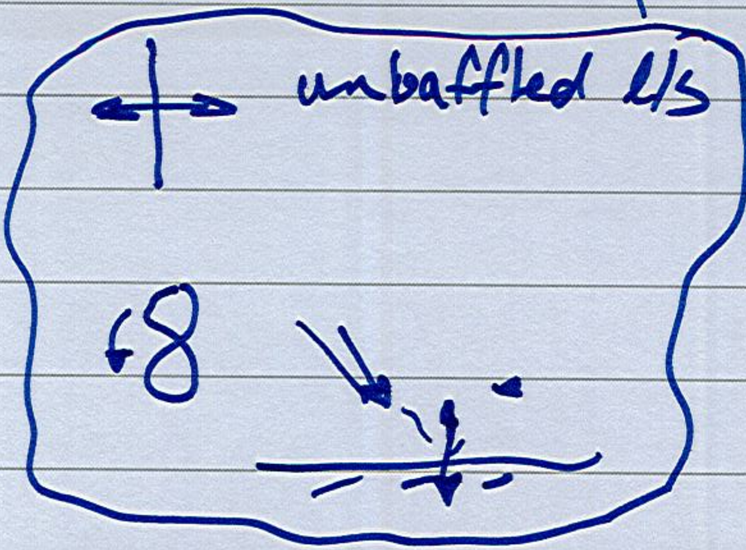
two monopoles, closely-spaced
& running 180° out-of-phase
creates a dipole

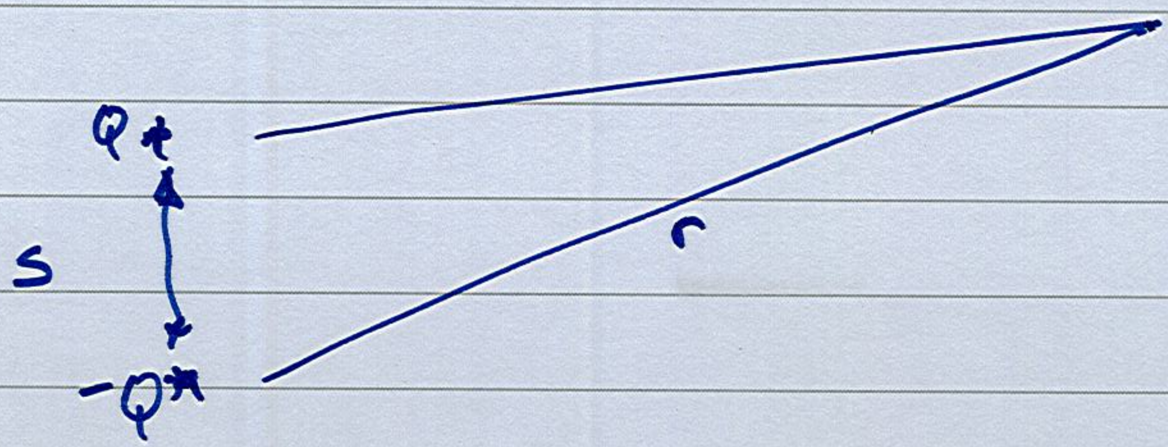


monopole
- mass or volume source

dipole - force source

pair of monopoles has the effect of creating an oscillatory pt. force that accelerates fluid back and forth along the dipole axis




Q
s
-Q
r