Music 170: Formulas for week 8

Sound intensity (defined in Rossing chapter chapoter 6 as power per unit area) goes down with distance. If the source of a sound sends it in all directions equally, then the intensity I is related to the total power W by the formula of page 101:

$$I = \frac{1}{4\pi r^2} W$$

Intensity can be converted to the level (in dB) by the formula,

$$L = 10log(I/I_0)$$

(page 102).

Chapter 23 gives this formula for predicting room reverberation times:

$$\text{RT60} = 0.161 \frac{\text{sec}}{\text{meter}} \frac{V}{A} = 0.161 \frac{\text{sec}}{\text{meter}} \frac{V}{Sa}$$

where V is volume, A is "absorptive area", S is total surface area, and a is the average *absorption coefficient* of the surface. This can (and usually does) depend on frequency.

Chapter 21 develops the theory of digital storage of sound. Suppose a soundfile has b bits per sample, c channels, and a sample rate of R. The signal to noise ratio of the soundfile depends on b. In decibels, it is:

$$\text{SNR} = 20\log_{10}(2)b \approx 6.02b$$

The maximum frequency the soundfile can hold is $R/2$. The size in bits required to hold a second of sound is bcR (bits per sample times number of channels times sample rate).