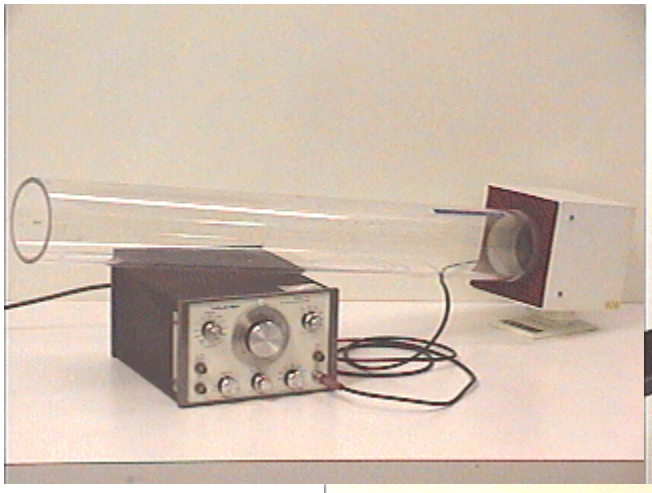
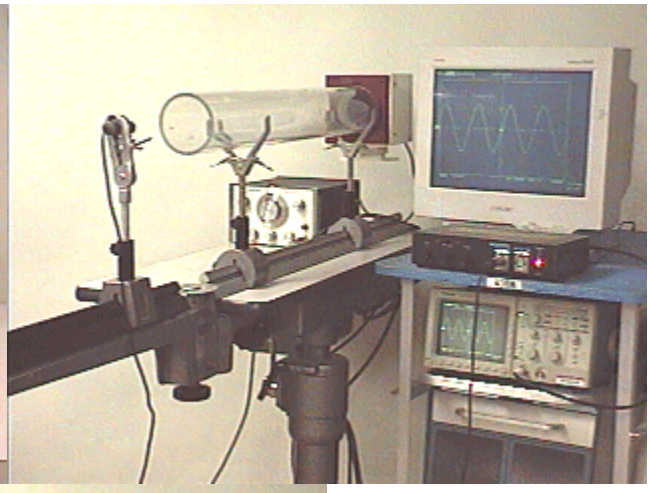
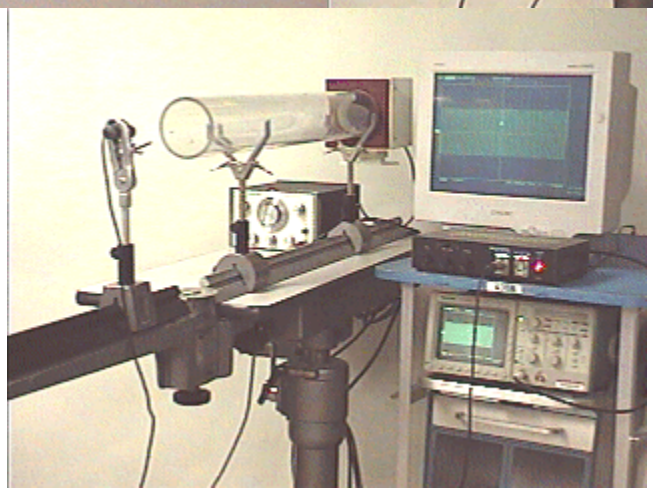
Question #143

The device in the photograph at the left below, called an acoustic collimator, consists of a loudspeaker and a long, narrow tube that is opaque to sound waves. If this were a narrow tube opaque to light waves it would create a narrow beam of light pointed in the direction of the tube opening, sort of like a laser. The light would spread out very slowly due to the inverse square law and diffraction.

Sound spreads out much more than light due to diffraction, as can be seen in an mpeg video by clicking your mouse on the photograph at the right. In this case a 400 Hertz sine wave is used, and spreads out uniformly around the opening so that the amplitude of the wave picked up by the microphone is about the same at all angles from (0^o to 90^o).







Now we will change the frequency to 4000 Hertz, as seen in the photograph at the right above, and repeat the experiment.

For the case of 4000 Hertz sound waves, the amplitude of the signal picked up by the microphone at 90^o will be:

- (a) greater than that at 0^o.
- (b) less than that at 0^o.
- (c) about the same as that at 0^o.

Click here for Answer #143 after March 17, 2003.

Question of the Week

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For questions and comments regarding the *Question of the Week* contact Dr. Richard E. Berg by e-mail or using phone number or regular mail address given on the Lecture-Demonstration Home Page.