HYDRODYNAMICS LAB

PURPOSE: One purpose of this lab is to measure the motion of a float in regular waves and to construct an RAO based on the measurements. Another purpose is to examine the response of the float in random waves.

SETUP: The setup is installed in the wave tank. The body is a cylindrical float. It is constrained by a set of linear bushings to move in heave only. A YO YO pot displacement sensor is used to measure its heave motion. A wave probe is used to measure the waves. The YO YO pot and wave probe are connected to an oscilloscope. Data is taken for the float with various drag devices attached to it.

REPORT: Using regular wave data, plot the RAO versus wave frequency. Using random wave data, determine the wave and response spectra. From the spectra, estimate the RAO at resonance and compare that with the regular wave RAO.

BACKGROUND THEORY

The Response Amplitude Operator or RAO for a floating body in waves is the amplitude of the response of the body divided by the amplitude of the wave:

$$RAO = R_o / W_o$$

This can be measured in an experiment.

The spectrum S for a random signal is

$$S_A = A^2 / \Delta\omega$$

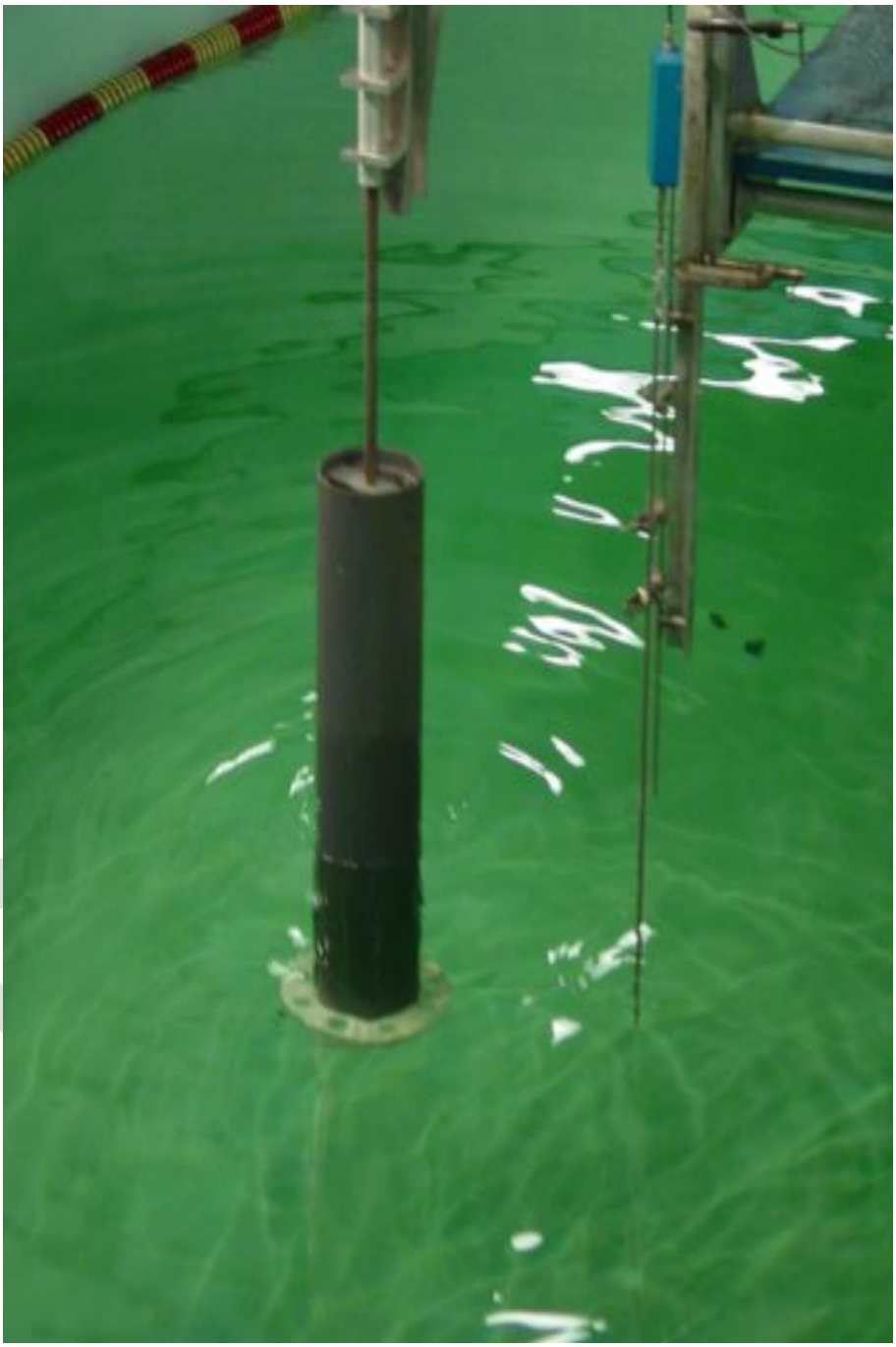
where A is amplitude and ω is frequency.

For a body and a wave they are

$$S_R = R^2 / \Delta\omega \qquad S_W = W^2 / \Delta\omega$$

Manipulation gives

$$S_R = RAO^2 \, S_W \qquad RAO = \sqrt{[S_R/S_W]}$$



RAO TEST

HZ	WAVE	FLOAT