Introduction to acoustical oceanography- Lab 4: scattering from a sphere, a computer lab.
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The purpose of this part of the lab is to get you familiar with Anderson’s (1950) and Faran’s solutions for acoustic scattering from a sphere. Anderson’s model is designed for a fluid sphere but neglects shear waves, viscous and thermal losses. Faran’s model includes shear waves and is designed to deal with solid spheres.

Open matlab and change directory to Lab_6 (on your desktop).
Open the program anderson_EB.m and get familiar with its syntax.

- Use code from within the program validation_EB.m which uses Anderson’s model to generate the form function for a bubble (c~300m/s, \( \rho \sim 1\text{kg/m}^3 \)) as function of \( k_a \) and (for given \( k_a \)’s) its angular distribution.

- Modify your program to solve for a zooplankton (Euphausiid, E. Pacifica, Johnson, 1977), \( g \sim 1.038 \) and \( h \sim 1.033 \).

- Modify your program to solve for a ‘rigid’ particle, \( \rho/\rho_{\text{water}} \gg 1 \) and \( c/c_{\text{water}} \gg 1 \).

Open the program faran.m and get familiar with its syntax.

Use code from within the program go_validate.m which uses faran’s model to generate the form function of an aluminium ball (c~6420m/s, \( \rho \sim 2700\text{kg/m}^3 \), poison ratio~0.355) ball as function of \( k_a \) and the angular distribution for given \( k_a \)’s. How would you convert your output to target strength - TS?

Homework:
With respect to the lab you conducted last time:
Glass microsphere (Whitehouse scientific, GP0083):
Size~75-90\( \mu \)m
Poisson ration~ 0.21
Specific gravity 2.46 g/cm3
Compressional Sound speed – 5292m/s
Shear velocity - 3469 m/s

1. Using the models, plot the acoustical form function squared (\( |f_\infty|^2 \)) and the squared reflectivity at 25degrees (\( |R(25)|^2 \)) as function of bead size for particles size of \( 1 \rightarrow 1000 \) \( \mu \)m and a source of 16MHz. Are they different? (see go_validate.m for an example on how to run the faran.m model).

2. Plot the ‘sensitivity’ (acoustic cross section/volume of sphere) as function of size. Which size has the highest ‘sensitivity’? What is its \( k_a \)?