Circumferential-wave phase velocities for empty, fluid-immersed spherical metal shells -
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In earlier studies of acoustic scattering resonances and of the dispersive phase velocities of surface waves that generate them [see, e.g., Talmant et al., J. Acoust. Soc. Am. 86, 278–289 (1989) for spherical aluminum shells] we have demonstrated the effectiveness and accuracy of obtaining phase velocity dispersion curves from the known acoustic resonance frequencies. This possibility is offered through the condition of phase matching after each complete circumnavigation of these waves [Überall et al., J. Acoust. Soc. Am. 61, 711–715 (1977)], which leads to a very close agreement of resonance results with those calculated from three-dimensional elasticity theory whenever the latter are available. The present investigation is based on the mentioned resonance frequency/elasticity theory connection, and we obtain comparative circumferential-wave dispersion-curve results for water-loaded, evacuated spherical metal shells of aluminum, stainless steel, and tungsten carbide. In particular, the characteristic upturn of the dispersion curves of low-order shell-borne circumferential waves (A or A0 waves) which takes place on spherical shells when the frequency tends towards very low values, is demonstrated here for all cases of the metals under consideration. ©2002 Acoustical Society of America.

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