Coupled Scholte modes supported by “soft” elastic plates underwater

B. M. Staples[1], A. P. Hibbins[1], and J. R. Sambles[1]

[1]Department of Physics and Astronomy, University of Exeter, Exeter, EX4 4QL

Acoustic surface waves and the acoustic modes of plates have been extensively researched, including the Scholte wave – a non-radiative, trapped acoustic surface wave that propagates at the interface between a fluid and a solid [1]. However very few studies explore the case of “soft” solid-fluid interfaces, where the Scholte velocity and the transverse speed of sound in the solid are notably less than the speed of sound in the fluid [2]. Indeed, because the vast majority of studies involve ‘hard’ solids, such as steel and aluminium that have a Scholte mode which is very weakly localised at the solid surface then the potential for acoustic surface wave studies, akin to that of surface plasmons in the visible has been almost completely overlooked.

Our study is the first to consider coupled Scholte modes in “soft” plates underwater, and presents the theoretical prediction of two distinct dispersion curves for the symmetric and antisymmetric coupled Scholte modes, before providing experimental verification of their existence. The nature of these modes are comparable to that of coupled surface plasmons, highlighting the possibility of transferable concepts [3].

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