Acoustic Radiation from Fluid-Loaded Rectangular Plates

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of the five cutoff frequencies are modified by the presence of the liquid layer. A variety of numerical results are presented in graphical form.

11:15

4B8. Acoustic Radiation from Fluid-Loaded Rectangular Plates. HUW G. DAVIES, *Massachusetts Institute of Technology, Cambridge, Massachusetts 02139.*—The acoustic radiation into a fluid-filled infinite half-space from a randomly excited, thin rectangular plate inserted in an infinite baffle is discussed. The analysis is based on the *in vacuo* modes of the plate. The modal coupling coefficients are evaluated approximately at both low and high (but below acoustic critical) frequencies. An approximate solution of the resulting infinite set of linear simultaneous equations for the plate modal velocity amplitudes is obtained in terms of modal admittances of the plate–fluid system. These admittances describe the important modal coupling due to both fluid inertia and radiation damping effects. The effective amount of coupling, and hence the effective radiation damping acting on a mode, depends on the relative magnitudes of the structural damping—i.e., on the widths of the modal resonance peaks and on the frequency spacing of the resonances. Expressions are obtained for the spectral density of the radiated acoustic power for the particular case of excitation by a turbulent boundary layer. [Work supported by the Office of Naval Research.]

11:30

4B9. Sound Radiated by Beam-Stiffened Plate. D. FEIT AND H. SAURENMAN, *Cambridge Acoustical Associates, Inc., Cambridge, Massachusetts 02139.*—A common structural element in aerospace and marine vehicle design consists of a relatively thin skin supported by a framework of attached beams. The present study treats this configuration as a thin elastic plate with one or more parallel beams attached. In order to find the sound pressure radiated by such a plate, the dynamic response of the plate beam system is first computed following the procedure of Lamb [J. Acoust. Soc. Amer. **33**, 628–633 (1961)]. The two-dimensional Fourier transform of the response thus obtained is used to calculate the radiated sound pressure. The resulting pressure field is then used as an indirect means of finding the significant interframe resonances. [The work presented here was supported by the Office of Naval Research Structural Mechanics Branch.]

11:45

4B10. Comparison between Theory and Experiment for a Mechanical Luneberg Lens. G. A. BRIGHAM, *Autonetics Division of North American Rockwell Corporation, Anaheim, California 92803.*—The first mechanical Luneberg lens was built and tested by Toulis in the latter half of the previous decade. Using the wave theory [C. A. Boyles, J. Acoust. Soc. Amer. **43**, 709 (1968); G. E. Lord, J. Acoust. Soc. Amer. **43**, 1177(L) (1968); G. A. Brigham, Int. Congr. Acoust., 6th, Tokyo (August 1968)] for a Luneberg lens with a monopole feed close to the nearfield, we have computed, for Toulis' test conditions, the polar response of an ideal lens. The comparison is within 4 dB throughout the 180° scanning pattern. Visual observation of Toulis' compliant-tube lens reveals that the actual fabrication would produce some cylindrical effects in the lens. When allowances are made for this, the theory and experiment are observed to be within 2 dB of each other in the full pattern over the 2 oct test bandwidth.

12:00

4B11. Sinusoidal Horns. B. N. NAGARKAR, T. D. MATHIS, A. P. RIPPER, AND R. D. FINCH, *Department of Mechanical Engineering, University of Houston, Houston, Texas 77004.*—It is pointed out that a sinusoid satisfies Salmon's criterion for a good horn shape. Calculations have been made of the throat impedance of sinusoidal horns of various dimensions, including the case of a single globe terminating in a cusp. Depending on the relative dimensions of the mouth and throat, the device may be used as an impedance transformer. Experimental determinations of directivity of an underwater horn have been made and found to compare favorably with conical horns. Finally, it is demonstrated that several musical instruments employ sinusoidal cavities, the bell of the English horn being discussed in particular.

TUESDAY, 4 NOVEMBER 1969 — DON ROOM, 9:30 A.M.

Session 4C. Interaction of Light with Sound Waves I

O. K. MAWARDI, *Chairman*

Invited Papers (40 minutes)

9:30

4C1. Birth and Growth of Brillouin Scattering. LEON BRILLOUIN, *New York.*

(Abstract not received)

10:15

4C2. Quantitative Investigations of Stimulated Brillouin Scattering. W. KAISER, *Physics Department, Technische Hochschule, Munich, Germany.*

(Abstract not received)

11:00

4C3. Resonance-Enhanced Brillouin Scattering in Crystals. R. ITO, E. BURSTEIN, A. PINCZUK, AND M. L. SHAND, *Department of Physics, University of Pennsylvania, Philadelphia, Pennsylvania 19104.*—The Brillouin scattering intensity exhibits resonance enhancement as the frequency of the incident