9:15

Z2. Optimization of magnetically coupled drive of the ear. John A. Mooney and George Moushegian (Callier Center for Communication Disorders, The University of Texas, 1966 Inwood Rd., Dallas, TX 75235)

The ear level hearing aid represents the ultimate in basic hearing aid configuration. This paper presents a feasible electromagnetic drive approach that virtually eliminates acoustic feedback problems of ear level aids as well as providing precise low distortion performance heretofore unavailable in a miniature aid. New magnetic materials of the platinum–cobalt and rare earth cobalt class make possible the realization of the goal of 100 dB *re* 0 dB = 0.0002 dyn/cm^2 sensation level for 1 mW input as needed for low battery drain. These acoustic levels are measured via frequency following potentials (FFP) as well as by the microphonic cochlear potentials recorded at the round window. Suggested additional features are covered as well as the culminating role of electret microphones, lithium batteries, and modern IC fabrication techniques to make possible a programmable aid of unprecedented quality. [Supported by NIH grant.]

9:30

Z3. Effects of temperature on the aging rate of piezoelectric polymer. J.M. Powers (Naval Underwater Systems Center, New London, CT 06320)

Results of aging measurements at 20 °C, 57 °C, and 66 °C are presented for commercially available piezoelectric polymer (28-μm thick, poled polyvinylidene fluoride). The g_{31} (electric field/stress) and d_{31} (charge density/stress) piezoelectric constants were measured by a static dead weight tension test. The relative dielectric constant K_{33}^T was obtained from a 1-kHz capacitance measurement. At room temperature (20 °C), aging rates of 10%/time decade for g_{31}, 15%/time decade for d_{31}, and 7%/time decade for K_{33}^T were obtained over a 100-day period from date of poling. Values of g_{31} and K_{33}^T were measured (at room temperature) for samples held at 57 °C and 66 °C for 100 days starting at 400 days from poling. For the 57 °C case, g_{31} values at 401, 410, and 500 days showed a 3%, 10%, and 16% decrease over the 400-day value. The 66 °C case showed decreases of 16%, 19%, and 21% in g_{31} over the same time period. No change in K_{33}^T was observed for either of these cases. [Work supported by R.R. Smith, Code 302, Naval Ocean Systems Center, San Diego, CA.]

9:45

Z4. Effect of fillers on acoustic properties of silicone rubber at ultrasonic frequencies. R.D. Corsaro and J. Klunder (Code 8131, Naval Research Laboratory, Washington, DC 20375)

We have had a recurring need for molded articles (wave guides) and thin anechoic coatings, composed of rubbers with well defined and continuously variable acoustic properties. To fill this need, we have measured the dependence of various acoustic properties (sound speed, density, absorption) on the amount and type of filler added to RTV 602 silicone rubber. Both high impedance (ferric oxide, lead) and low impedance (glass and backlite microballons) modifiers were added, in two and three component mixes. A diluent (toluene) was found, which had no observed effect on the acoustic properties of the resulting rubber. Acoustic measurements were made using thick (molded) slabs, as well as thin (sprayed) coatings. In the latter case, sound speed and absorption is evaluated using the measured frequency dependence of the coating's impedance. In all cases, we find that density and sound speed is well described using ideal mixture theory, providing the geometry of the microballons is taken into account. Absorption is described by simple phenomenological equations, and compared with theoretical predictions.

10:00

Z5. Experimental study of the effects of water repellant treatment on the acoustic properties of Kevlar. C.D. Smith (Old Dominion University, Norfolk, VA 23508) and T.L. Parrott (NASA–Langley Research Center, Hampton, VA 23665)

The effects of water repellant treatment of the acoustic properties of a bulk absorber have been investigated. The bulk absorber consisted of a synthetic fibrous material (Kevlar 29, style 1270) manufactured by DuPont. The propagation constant, γ, and the characteristic impedance Z_c were measured over the frequency range 0.5 to 3.5 kHz. The measurements were conducted before and after a controlled application of water repellant treatment ("Zepel" DA-24*M*), also manufactured by DuPont. A comparison of test results indicated changes in both γ and Z_c. These changes in γ and Z_c generally increased with frequency. At the highest test frequency, the attenuation constant (real part of γ) and phase constant (imaginary part of γ) decreased by about 8% and 10%, respectively, when the treatment was applied. Corresponding changes in the real and imaginary parts of Z_c at the test frequency of 3.5 kHz were about 6% and 25%, respectively.

10:15

Z6. Experimental determination of acoustic properties using a two-microphone random-excitation technique. D.F. Ross (Arvin Industries, Inc., Lafayette, IN 47906) and A.F. Seybert (Department of Mechanical Engineering, University of Kentucky, Lexington, KY 40506)

An experimental technique is presented for the determination of normal acoustic properties in a tube, including the effect of mean flow. White noise is used to produce a randomly fluctuating sound field and two stationary, wall-mounted microphones measure the sound pressure at arbitrary but known positions in the tube. Theory is developed, including the effect of mean flow, showing that the incident- and reflected-wave spectra, and the phase angle between the incident and reflected waves, can be determined from measurement of the auto- and cross-spectra of the two microphone signals. Expressions for the normal specific acoustic impedance and the reflection coefficient of the tube termination are developed for a random sound field in the tube. Three no-flow test cases are evaluated using the two-microphone random-excitation technique. Comparison is made between results using the present method and approximate theory and results from the traditional standing wave method. In all cases agreement is very good. [Research conducted at Purdue University, Lafayette, IN.]

10:30

Z7. Scattering of a sound wave from a grating of hollow elastic bars in a viscoelastic layer. R.P. Radlinski and J.J. Libuha (Naval Underwater Systems Center, New London Laboratory, New London, CT 06320)

The problem of the scattering of a normally incident plane sound wave by an infinite grating of hollow elastic bars in a viscoelastic layer between two fluid half spaces is solved by the method of partial domains. The solution in the layer is formulated in terms of inhomogeneous plane dilatational and shear waves. The attenuation is found to be always normal to the plane of the grating. The evanescent waves in the viscoelastic medium necessarily cannot propagate parallel to the grating as is the case for an elasticlike or fluid medium. The dependence of the grating transmissivity on parameters of the individual bars and the complex-valued, frequency dependent, material properties of the layer is analyzed quantitatively. By using measured viscoelastic material properties as input to the model, comparisons of predictions of transmissivity are made with experimental data. [Work supported by NAVSEA.]