PROGRAM OF

The 88th Meeting of the Acoustical Society of America

Chase–Park Plaza Hotel • St. Louis, Missouri • 4–8 November 1974

TUESDAY, 5 NOVEMBER 1974 CHASE CLUB, 9:30 A.M.

Session A. Physical Acoustics I: Atmospheric Acoustics

J. E. Piercy, Co-Chairman

Division of Physics, National Research Council of Canada, Ottawa K1A OR6, Canada

Allan Pierce, Co-Chairman

School of Mechanical Engineering, Georgia Institute of Technology, Atlanta, Georgia 30332

Invited Papers

9:30

A1. Kinetic description of sound absorption in the atmosphere. H. E. Bass (Department of Physics, University of Mississippi, University, Mississippi 38677), J. E. Piercy (National Research Council, Ottawa, Ontario, Canada KIA 0S1), L. B. Evans (The Boeing Co., Wichita, Kansas 67210), and L. C. Sutherland (Wyle Laboratories, 128 Maryland St., El Segundo, California 90234)

Utilizing kinetic information obtained from acoustical, optical, and opto-acoustical experiments, a comprehensive description of molecular relaxation in the atmosphere has been developed as the theoretical basis for a method of calculating the absorption of sound in air discussed in the following paper. The effects of atmospheric pressure and sound frequency on absorption evolve easily from the theory. The limitations imposed on theoretical calculations by insufficient energy transfer rate information are discussed. Many of the rates required to predict sound absorption are most easily measured using optical techniques. The similarity of acoustic and high-energy laser beam propagation through the atmosphere is discussed. [Work supported by the Army Research Office, Durham, North Carolina.]

9:55

A2. Method for calculating the absorption of sound by the atmosphere. L. C. Sutherland (Wyle Laboratories, 128 Maryland Street, El Segundo, California 90245), J. E. Piercy (National Research Council, Ottawa, Ontario, Canada K1A 0S1), H. E. Bass (Department of Physics, University of Mississippi, University, Mississippi 38677), and L. B. Evans (The Boeing Co., Wichita, Kansas 67210)

The aim is a standard method of calculation with the credibility necessary to support major compromises between economic and environmental benefits desired by society. A two-relaxation model for the absorption of sound in air is fitted to a maximum of available laboratory and field measurements, as well as the detailed knowledge of basic mechanisms described in the previous paper. In this way, a set of seven fairly simple equations are generated whose form is determined by the physical nature of the mechanisms. These formulas may be used to compute the absorption of a pure tone over the following range of variables to an estimated accuracy of $\pm(10+1.5|t-20|)\%$: frequency/pressure 10^2 to 10^5 Hz/atm, temperature (t) 0° to +35 °C (32°—95 °F), relative humidity 10%—100%, pressure 2 atm or less. A method of corrected the result to apply to bands of noise is proposed.