PHYSICS

Chairman: Elmer Nussbaum
Physics Department, Taylor University, Upland, Indiana 46989

Chairman-Elect: Carl C. Sartain
Department of Physics, Indiana State University, Terre Haute, Indiana 47809

Abstracts

A Proposed Technique for the Computer-Aided Measurement of Loudspeaker Driver Parameters. Ralph L. Place, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.——Principles of a technique are discussed for measuring loudspeaker driver parameters in which the loudspeaker in open-air is treated as an underdamped harmonic oscillator. Voltage information from the device under test is digitized by a fast analog-to-digital converter. Timing information is obtained using a gated crystal coltrolled oscillator circuit that provides the timing information in BCD form. Data acquisition occurs in time intervals between 20 msec and 500 msec in duration, depending on the resonance frequency of the device. Real-time data acquisition and storage occurs with subsequent analysis of the data by the computer. Two additional measurements must be made, one of initial current through the voice-coil and one of the resulting initial displacement.

Computer Analysis of Alfven Wave Data. Ying Guey Fuh and Uwe J. Hansen.——A parallel faced bismuth samples serves as an interferometer for Alfvén waves propagating in the compensated semi-metal at high magnetic fields. Resulting interference fringes are periodic in 1/B. A computer program was written to analyze this periodicity and extract effective mass density parameters from the slope of the straight line plot of the interference fringe index vs. 1/B. The computer program is designed to process data from the digital output of a high pressure Alfvén wave experiment.

The Economical Development of a Practical Holography Table. John A. Wisler and F. R. Steldt.——Construction of an inexpensive and portable holography table has been developed, such that the unit can function in economical hologram production and be operated at the undergraduate level. The unit incorporates three levels. Stability is attained at level one by use of an inner tube supported sandbox. Physical vibrations of the unit are monitored at the second level by a Michelson Interferometer. The third upper level functions as the holography area. This area is void of the bulky laser unit by transferring the beam from a second level housing to the main holography area through a mirror-shutter system. This allows both larger hologram production and an expanded experimentation area.

Pressurization Technique for Alfven Wave Studies in Bismuth. Gary W. Erwin and Uwe J. Hansen.——A low cost, small volume gas pressure system was assembled and tested at room temperature and pressures to 27,500 PSI. The

experimental volume, a reservoir and the pump were presurized from a Helium gas tank at 3,000 PSI. Subsequently, the pressure in the experimental volume was raised to 27,500 PSI in 10 pump strokes. A modified van der Waals equation of state was used for volume and pressure calculations to reach the highest pressure in the least number of pump strokes. A comparison of this system with an oil reservoir system was made.

Initial Experimentation of the Thermal Pollution of the Middle Wabash River. VINCENT A. DINOTO, JR., Physics Department, Indiana State University.—— To show how the Middle Wabash River does not conform to the theoretical harmonical temperature curves of the U.S. Geological Survey, near Terre Haute, Indiana. By the use of a PDP8/I computer with a KV8/I display scope used to plot the theoretical curves with the experimental data points. The experimental data was taken with a Martex Mark V Probe, by the author and the West-Central Indiana Economical Development District, Water Quality Division. With a discussion of the possible cause and effect to the river ecology due to the termperature increases.

A Low-Cost, Student-Built Communications Interface Project for an 8080A Based Microcomputer and a PDP 11/40 Minicomputer. JOHN STROMSETH, GARY STERN and STANLEY BURDEN, Physics and Computer Science Departments, Taylor University, Upland, Indiana 46989.——A project for undergraduate students who are ready to engage in or who have completed a study of universal asynchronous receiver/transmitters (UARTS) in a digital electronics or computer interfacing course is described. The project can be either hardware or software oriented depending on the students' interest. An asynchronous communications link was designed which permits an E & L Mini Micro Designer to appear as a high speed programmable terminal to a PDP 11/40 computer. The interface was designed by students and assembled on a solderless breadboard with components totaling approximately $30. The interface permits students to write, edit and cross-assemble programs on the PDP 11/40 and then dump them to the microcomputer RAM. This makes possible operations otherwise impossible with a microcomputer having only 2.5K of RAM, since all of the PDP 11/40 memory and peripherals are accessible to the microcomputer. A student-written cross-assembler was also part of the project.

A Low-Cost, Student-Built Digital Integrator for Computerized Logging of Solar Insolation Data. KENT W. BULLIS and STANLEY L. BURDEN, Chemistry Department, Taylor University, Upland, Indiana 46989.——A solar-insolation data logging system which provides average values of insolation occurring during a specified sampling interval is described. An Eppley model 8-48 Black and White Pyranometer is used to measure the insolation. The pyranometer output signal is amplified and converted to a frequency by a Heath voltage-frequency converter and integrated. The associated counter, real-time clock and sequencing logic are constructed from standard TTL integrated circuits. The resulting information is entered into a PDP-8-L minicomputer using Heath Computer Interface Buffer equipment. At specified intervals the computer inputs the integrated value from the counter, resets the counter to zero, and

converts the integrated value to a mean, which it stores on magentic tape cassette and prints out along with the clock time as it collects the data. The cost of the pyranometer integraor, excluding the V-F converter, which was previously owned, was about $50.

Computer Assisted Instruction Modules for Physical Science. MALCOM E. HULTS and RALPH L. PLACE, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.——Six computer assisted instruction modules, each consisting of twenty-five multiple choice questions, were written covering the basic topics of mechanics, properties of matter, heat, sound, light, electricity and magnetism. Three of the modules are basically simple recall while the other three are sets of simple problems. A computer program records the date, time, number of questions attempted, a final percent score and bonus points for each student using the modules. Use of the computer was strictly voluntary. Correlation of grades and use of the modules is discussed.

Construction of a Molecular Nitrogen Laser and a Tunable Dye Laser for Lifetime Studies. KEVIN E. GARDNER, Department of Physics and Astronomy, Ball State University, Muncie, Indiana 47306.——The construction of a pulsed molecular nitrogen laser to operate in the near ultraviolet range is discussed. The super radiance of this laser is to be used to stimulate lasing in an already existing tunable dye laser. The complete system is to be used for lifetime measurements especially of metastable levels of various metals.

A Summary of Solar Energy Activities in Indiana. ELMER NUSSBAUM, Physics Department, Taylor University, Upland, Indiana 46989.——Indiana's self assessment while bidding for ERDA's new Federal Solar Energy Research Institute provided an excellent opportunity to survey the state's interest and its activities related to solar energy. Though the bid was unsuccessful, the effort produced lasting positive effects. Indiana's growing role in solar programs can be documented by its increasing participation in HUD and ERDA grant programs. Memberships by Indiana firms and individuals in solar energy trade and professional organizations indicate statewide interest in learning about and becoming involved in solar energy options. Recent state legislation which provides tax relief serves as a further inducement to Indiana residents to include solar heating in new residential housing.

An Innovative Approach to Environmental Physics Education. GREGORY PETERSON, Department of Physics, Indiana State University, Terre Haute, Indiana 47809.——The environment of our lakes is a very strong emphasis in an environmental physics course (Physics 470/570) taught at Indiana State University. The major portion of the laboratory time spent by the students was used performing various water sampling tasks. An underwater camera, made available by an Indiana Academy of Science grant, was utilized to give students a view of the sampling devices as well as fish life and the underwater vegetation.

A Brief Report of "History of Physics in Great Britain", The Professor's View. CARL C. SARTAIN, Indiana State University, Terre Haute, Indiana 47809.——This paper is a brief report on the "History of Physics in Great Britain". It describes who we are, where we went, what we saw, who lectured to us, and how well we met our objective—to improve our teaching of Physics by using historical examples, events and personalities.