



PRD

MICROWAVE SPECTROSCOPY COMPONENTS

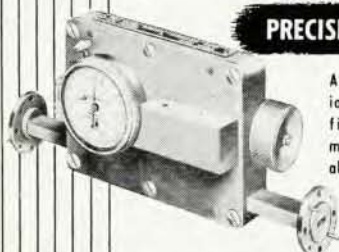
BROADBAND TUNERS

Low-loss, hybrid type matching transformers of novel design now complement the PRD line of slide screw and double stub tuners to provide full coverage of the 2.4 to 40 kmc/sec. region.



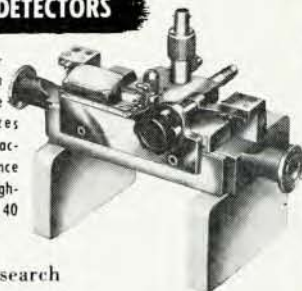
PRECISION ATTENUATORS

A complete line of fixed and variable attenuators of the metallic-film-on-glass variety insures maximum accuracy of relative absorption measurements over the 2.6 to 40 kmc/sec. band.



STANDING WAVE DETECTORS

Precision slotted sections and probes in standard coaxial line and waveguide sizes provide maximum accuracy for impedance measurements throughout the entire 1 to 40 kmc/sec. spectrum.



Progressive research in microwave spectroscopy has created new applications for PRD's precision test equipment. The components illustrated above are augmented by a full complement of precision frequency meters, terminations, directional couplers, crystal and bolometer detectors, series, shunt, and hybrid tees, and the versatile new 801 Universal Klystron Power Supply.

WRITE DEPT. P-6 FOR A COMPLETE CATALOG OF AVAILABLE INSTRUMENTS.



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Acoustics and Chemistry

The presence of minute amounts of certain salts such as magnesium sulfate in water may produce large increases in the absorption of sound. This effect is interpreted as resulting from a disturbance of the normal ionic equilibrium present in solution by the passage of a sound wave. The shift in chemical equilibrium is a direct result of temperature and pressure variations in the sound field. At high acoustic frequencies, however, the chemical reaction may be too sluggish to respond to the rapid variations of temperature and pressure, and the sound absorption arising from the chemical reaction may become negligible. By determining the frequency at which chemical absorption vanishes, the reaction rate of the chemical reaction can be established. This technique may be particularly useful for exceedingly rapid chemical reactions.

Other chemical parameters, such as the equilibrium constant, are also related to the magnitude of the absorption and may be obtained from absorption studies. Some of the obscurity surrounding the nature of chemical reactions in solution may be lifted by studying the dependence of absorption on concentration. For example, bimolecular reactions in salt solutions would be expected to depend on the square root of the concentration while unimolecular reactions would depend on the three-halves power of the concentration. In order to illustrate these chemical-acoustic relationships the absorption of the magnesium sulfate solution is discussed in considerable detail. The theory implies that these unusual acoustical effects may not be confined to salt solutions alone but should be looked for in all fluids which contain chemically active components in equilibrium.

L.L.

Sound Propagation in Chemically Active Media. By Leonard Lieberman. *Phys. Rev.* 76: 1520, Nov. 15, 1949.

Cool Detectors

In the development of detectors of infrared radiation, mere empirical improvements are no longer sufficient. It is necessary to enquire what are the fundamental limitations to the performance, and how closely existing detectors approach these limits. Since 1943 several papers have discussed these questions from various points of view, and it has emerged that the sensitivity is limited by fluctuations in the temperature radiation received by the detector from its surroundings. These fluctuations are associated with randomness in the arrival of photons at the detector, and resemble in some ways the "shot" effect in an electron stream. In the present work a general method is given for finding the numerical value of the sensitivity limit. It is used to obtain the well known formula for the noise level in a radio antenna, illustrating that an antenna can be regarded as an infrared detector. The limiting sensitivity of certain photoconductive infrared cells is compared with their actual performance. This