

J9-7

JAPAN	UNITED KINGDOM
March 1959 $\eta_e = 98.65 \pm 0.6\%$	
December 1959 $\eta_e = 97.1 \pm 2\%$	July 1959 $\eta_e = 96.6 \pm 1.5\%$ (Flow calorimeter)
May 1960 $\eta_e = 99.5 \pm 0.6\%$	

and for the second mount, J9-6:

JAPAN	UNITED KINGDOM
March 1960 $\eta_e = 99.13 \pm 0.6\%$	May 1960 $\eta_e = 98.2 \pm 1\%$ (Film bolometer)

Once again, within the individually estimated limits of error, the values are essentially in agreement. This is obviously an important result, particularly in view of the basic differences in operating principles of the techniques employed.

It will be further noted, however, that most of the results obtained in the United Kingdom are of the order of one percent below the United States or Japanese results. Even though this difference is within the quoted limits of error, its consistent nature suggests the presence of a systematic error.

An exception to this general behavior is found in the results of the most recent U. S.—U. K. comparison. The reference standard employed by the United Kingdom was, in this case, the film bolometer.

A spokesman for the United Kingdom has indicated that the milliwatt power levels from their flow calorimeter or force-operated wattmeter may, in fact, be a nominal one percent below the correct value. Such an error might be inherent in these high-level power meters or, alternatively, may have been introduced in the calibration of the directional coupler used to provide the nominal 35 dB of attenuation required in comparing the high and low power standards. Further intercomparisons are planned between the United Kingdom and the United States in an effort to resolve this question.

In summary, a number of useful benefits have resulted from this intercomparison program. Perhaps the most important single result is the confidence and reassurance which stems from the close agreement achieved in the intercomparisons.

The secondary benefits include,

For Japan: An improved bolometer mount design has emerged from the correction of certain inherent weaknesses which were discovered as a result of the intercomparison process. The intercomparisons have also called attention to the fact that the agreement achieved between their impedance and calorimetric determinations could probably be improved, perhaps by adopting a technique similar to that employed at the National Bureau of Standards.

For the United Kingdom: This program

has suggested the possible existence of a systematic error, possibly as large as one percent, in their measurement system. In addition, their representatives have expressed a great deal of interest in the high efficiencies achieved by the bolometer mounts of Japanese and United States design and in the close agreement achieved by the calorimetric and impedance methods in the United States.

For the United States: The benefits are perhaps a bit less tangible than those already listed; however, a sizeable amount of stimulus has been derived from, and confidence developed in our measurement techniques, as a result of participating in this program.

Finally, the author is confident that he is expressing the sentiments of the representatives of Japan and the United Kingdom as well as those of the participating laboratory in the United States in extending the invitation for other interested countries to participate in these intercomparisons.

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Additional "Comment on Wave Propagation in Sinusoidally Stratified Dielectric Media"

ACKNOWLEDGMENT

In the above correspondence,¹ acknowledgment of a prior work was inadvertently

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¹ R. A. Kallas, *IEEE Trans. on Microwave Theory and Techniques (Correspondence)*, pp. 139-141, January 1965.

omitted. The undersigned wishes to apologize for this unintentional oversight and to acknowledge the earlier work of Professors Yeh and Kaprielian² on wave propagation in a sinusoidally stratified dielectric. Also the point made by Professor Yeh should be emphasized, that the original intent of the correspondence was to present an alternative approach in the derivation of the Mathieu and Hill equations and, additionally, to call attention to the potential applications inherent in the use of such a dielectric medium. The significance and importance of the earlier work² were of such a degree as to be of interest to the microwave community in general and, in particular, to those interested in microwave acoustics and phonon-photon interaction. The possibilities for device development are being actively explored and, hopefully, results will be forthcoming in the near future.

Professors Yeh and Kaprielian are to be complimented for completing the work on the Hill equation and investigating the TM mode propagation. The work will, of course, complement the earlier discussion of Tamir, *et al.*,³ which dealt with TE modes.

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² C. H. Yeh and Z. A. Kaprielian, "On inhomogeneously filled waveguides," University of Southern California, Engineering Center Los Angeles, Calif., Rept. 84-206, November 1963.

³ T. Tamir, H. C. Wang, and A. A. Oliner, "Wave propagation in sinusoidally stratified dielectric media," *IEEE Trans. on Microwave Theory and Techniques*, pp. 323-335, May 1964.

Recent Changes in High-Frequency and Microwave Calibration Services

The following short items describe recent changes in the calibration services offered by the Radio Standards Laboratory at Boulder, Colo.¹

The first three items are concerned with waveguide attenuation. Item I reports an extension of the frequency range of waveguide attenuation calibrations; Item II, an improvement in accuracy of measuring attenuation differences on variable attenuators; and Item III, an extension of reflection coefficient measurements to an additional waveguide size.

The remaining items relate to power-measuring devices. Item IV reports an extension in frequency range of calibration of RF calorimeters; Item V, an increase in range of power level for calibrations of X-band standards; and Item VI announces a change in the procedure for calibrating waveguide bolometer-coupler units.

I. WAVEGUIDE CALIBRATION CHANGES

The Radio Standards Laboratory has announced an extension of the attenuation

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¹ This laboratory is part of the Institute for Basic Standards of the National Bureau of Standards (U. S. Department of Commerce).