Status Report

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Development of a Stable Ultraviolet Source
and Techniques for Accurate Radiometry

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High Pressure Plasma Arc As A Useful Ultraviolet Standard

The spectral radiance investigations of the high pressure argon arc have been extended to a wavelength of 7000 A. The average day-to-day reproducibility of the spectral radiance in the region 3300 A to 7000 A is about 3% for both the 50 amp, 20 atmos. and the 75 amp, 15 atmos. cases. For the 50 amp case, the radiance temperature of the continuum drops from about 4500 °K at 3400 A to about 3250 °K at 6550 A.

In the 2100 A to 3100 A wavelength region, the radiance temperature of the arc has been determined at 100 A intervals. In the case of the 50 amp 20 atmos. arc, this temperature increases from 4740 °K at 3100 A to 5100 °K at 2500 A, reaches a maximum of 5240 °K at 2200 A and drops to 5120 °K at 2100 A; the corresponding figures for the 75 amp 15 atmos. case are 5000 °K, 5350 °K, 5480 °K and 5340 °K.

The maximum stable operating pressure of the 100 amp arc was found to be 10 atmos. Under these conditions, the output of the arc was no higher than that of the lower current cases, and excessive cathode consumption occurred, The 100 amp arc studies were therefore terminated.

Many of the results of the ultraviolet work have been collected in a paper entitled "A Stable Arc Source of High Ultraviolet Radiance" to be presented before the International Symposium on Solar Radiation Simulation in January 1965.

A proposal has been submitted for the development and investigation of a small portable model of this arc.

Standards and Tehcniques for Accurate Radiometry

Efforts to improve the quality of the high temperature black-body have been continued during this quarter. A new graphite tube and external radiation shield have been installed, along with modified internal shields, and the effect of various changes in tube geometry and insulation on the temperature gradients measured. The present configuration displays a maximum temperature gradient of 5 °K over the region extending 0.5 cm above and below the 1.0 cm high cavity.

Four commercial A. C. amplifiers were tested for their performance as a component of the spectroradiometer. Such an instrument will be used with the lead sulfide detector required to extend the wavelength range of the spectroradiometer to 2.5 microns. Two of the models were completely unsuitable, while a third appeared to meet minimum requirements. The fourth instrument (Brower Labs model 129) performed very satisfactorily, displaying a signal-to-noise ratio of about 1000 and negligible drift. Acquisition of a similar model, with more versatile frequency range, is planned.

An experimental check on the low range primary calibration of the spectroradiometer indicated that repeating such a check each 50 hours of use would maintain the accuracy of the primary calibration to 0.1%.

A proposal has been submitted concerning the spectral radiance determination of a low current carbon arc, development of spectral irradiance techniques and further consultation services.