NATIONAL BUREAU OF STANDARDS REPORT

3830

ISOCANDLE DISTRIBUTION AND LIFE OF PREPRODUCTION 100-PAR56 LAMP FOR LEAD-IN SYSTEMS

By

R. W. Crouch

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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Sinclair Weeks, *Secretary*

NATIONAL BUREAU OF STANDARDS
A. V. Astin, *Director*

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Electronics. Engineering Electronics. Electron Tubes. Electronic Computers. Electronic Instrumentation. Process Technology.

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PREPRODUCTION 100-PAR56 LAMP

FOR LEAD-IN SYSTEMS

Prepared by
R. W. Crouch
Photometry and Colorimetry Section
Optics and Metrology Division

Test 21A-12/54

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1. SCOPE

This report shows the isocandle distribution of three samples of a new 100-PAR56 lamp and the results of life-testing these samples.

2. LAMPS TESTED

The lamps tested are preproduction samples of a new lamp developed by the General Electric Company for the Airways Engineering Division of the Office of Federal Airways. They are marked on the back, "General Electric / 100 W - 115 V / Airport Approach", together with the numbers "1", "4", and "8" written in grease pencil to distinguish them from each other.

These lamps were specified by the Airways Engineering Division to have bulbs consisting of standard PAR56 reflectors, cover-lenses of the type used on the Navy 399-PAR lamps, and a power consumption of 100 watts at 115 volts. The voltage and power consumption were selected to meet the requirements of the CAA "lead-in" systems.

3. TEST PROCEDURE

To provide measured horizontal and vertical rotations of the test lamps, they were mounted in a special fixture on the table of a goniometer. The primary axis of rotation was horizontal and normal to the photometric axis. The line perpendicular to the vertical plane of the fixture at the center of the lamp aperture was taken as the axis of the lamp. The angles of the goniometer corresponding to this axis were determined by clamping a tube sight to the fixture so that the optical axis of the sight and the lamp axis were collinear. The goniometer was then rotated to make the optical axis of the tube sight and the photometric axis collinear and the horizontal and vertical angles of the goniometer were recorded as horizontal and vertical angles of reference (0°). The isocandle curves have been plotted with the axis of the lamp at the origin of coordinates.

The candlepower distribution was measured with an automatic photometer, the recording element of which was a Leeds & Northrup recording potentiometer driven in synchronism with the goniometer on which the lamp under test was mounted. The photometer was calibrated with standard lamp No. BS 3315 at a distance of 1.9 meters; the photometric distance was 30.0 meters (98.4 feet).

When the calibration adjustment was completed, a record was made on the candlepower distribution chart. In figures 1, 2, and 3 these records have been marked to show the test lamp candlepower which would be equivalent at the photocell to that of the standard lamp.

All photometric measurements were made with a 60-cycle, constant-voltage, source adjusted to give 115 volts between the test-lamp terminals. Since total lumen ratings are not available for preproduction lamps, no correction factors were introduced for the lumen output of the test lamps. The life of the three lamps was obtained by connecting them to a 60-cycle power source regulated to 115 volts, within ±0.2%. Throughout life they were inspected at intervals and the results quoted are within ±8 hours.

4. RESULTS

The vertical candlepower distribution curves in figures 1, 2, and 3 show a peak candlepower of approximately 4.5 kilocandles for each lamp. The double line, which appears in some parts of the distribution curves of figures 1, 2, and 3, resulted from repeating the measurements after the lamps had been in operation for approximately one-half hour in each case. During this time, additional horizontal distribution curves were made from which isocandle curves were plotted and drawn. The distribution of candlepower as shown by the curves in figures 4, 5, and 6 is remarkably free from the irregularities which are usually found in curves of this type. These figures also show the specified minimum values.

The electrical characteristics, as determined during the candlepower measurements, and the life are shown in the following table.

Table I

Lamp No.	Life Hours	Voltage (Set) Volts	Current Amperes	Watts (Computed)
1	558	115	.905	104
4	658	115	.908	104
8	754	115	.905	104

In the absence of a total-lumen rating, an estimate of the candlepower for an average lamp of the type tested can be made from the nominal

and actual wattage of the lamps. The test lamps were operated at 104% of their rated power. Using this value, 104%, and the formula*,

$$\frac{\text{operating lumens}}{\text{rated lumens}} = \left(\frac{\text{operating watts}}{\text{rated watts}}\right)^{2.19}$$

it is estimated that an average lamp of this type operating at 100 watts may be expected to have a candlepower in the indicated directions equal to the values shown on the isocandle curves decreased by the factor 0.92.

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*I.E.S. Handbook (2nd Ed.) 8-14.

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5. CONCLUSIONS

From the curves in figures 4, 5, and 6 and the values stated in Table I for the life, the lamps tested are found to be in accordance with the requirements for lead-in lights as communicated to this Bureau by the Office of Federal Airways, C.A.A.

LAMP FOR LEAD-IN SYSTEM

HORIZONTAL AND VERTICAL CANDLEPOWER DISTRIBUTIONS

as recorded by photometer

Lamp No. 1

LAMP 100-PAR
Bulb: PAR 56
Lens: Type 399 PAR 56
Rated: 100 Watts, 115 Volts

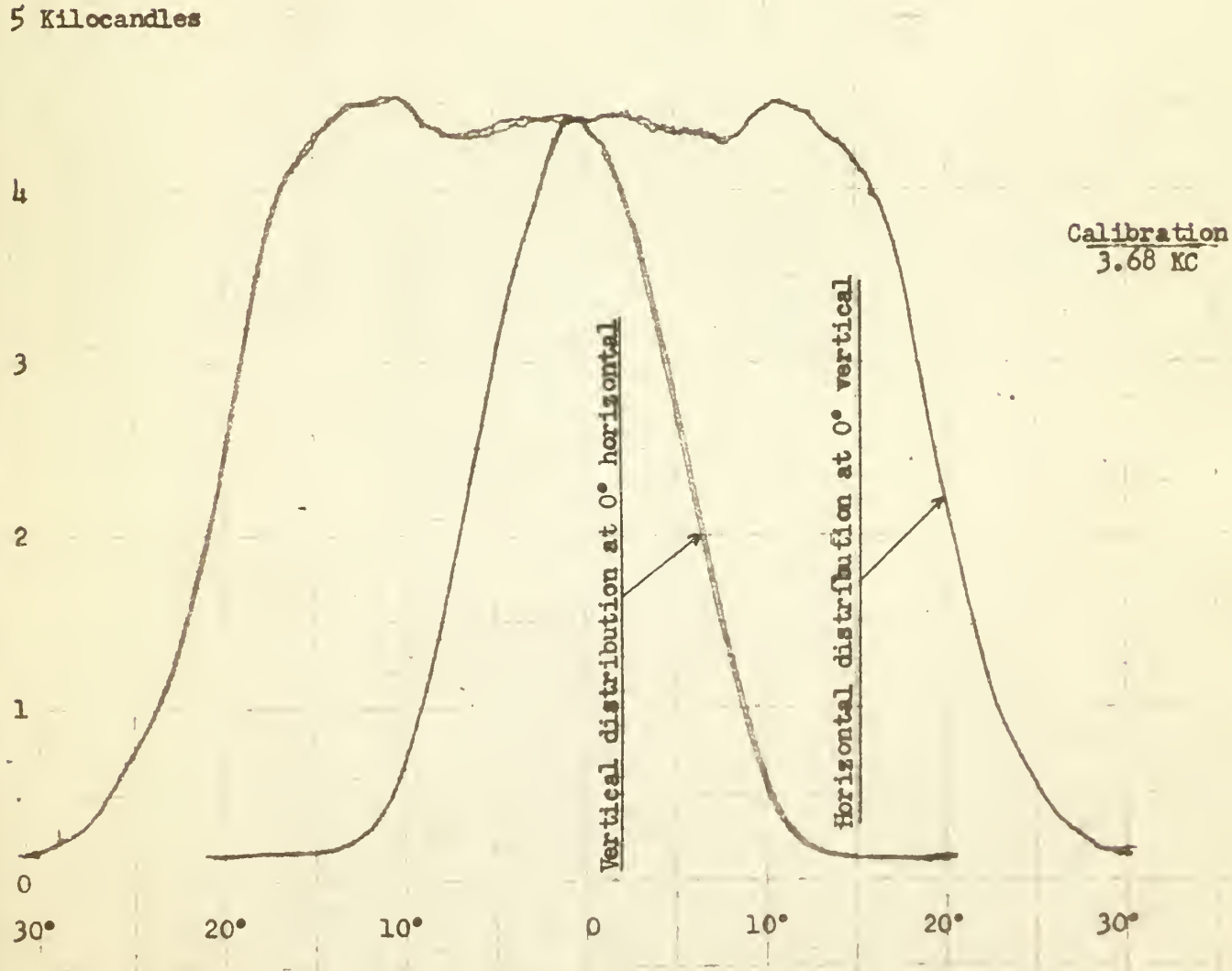

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Figure 1

LAMP FOR LEAD-IN SYSTEM

HORIZONTAL AND VERTICAL CANDLEPOWER DISTRIBUTIONS

as recorded by photometer

Lamp No. 4

LAMP 100-PAR
Bulb: PAR 56
Lens: Type 399 PAR 56
Rated: 100 Watts, 115 Volts

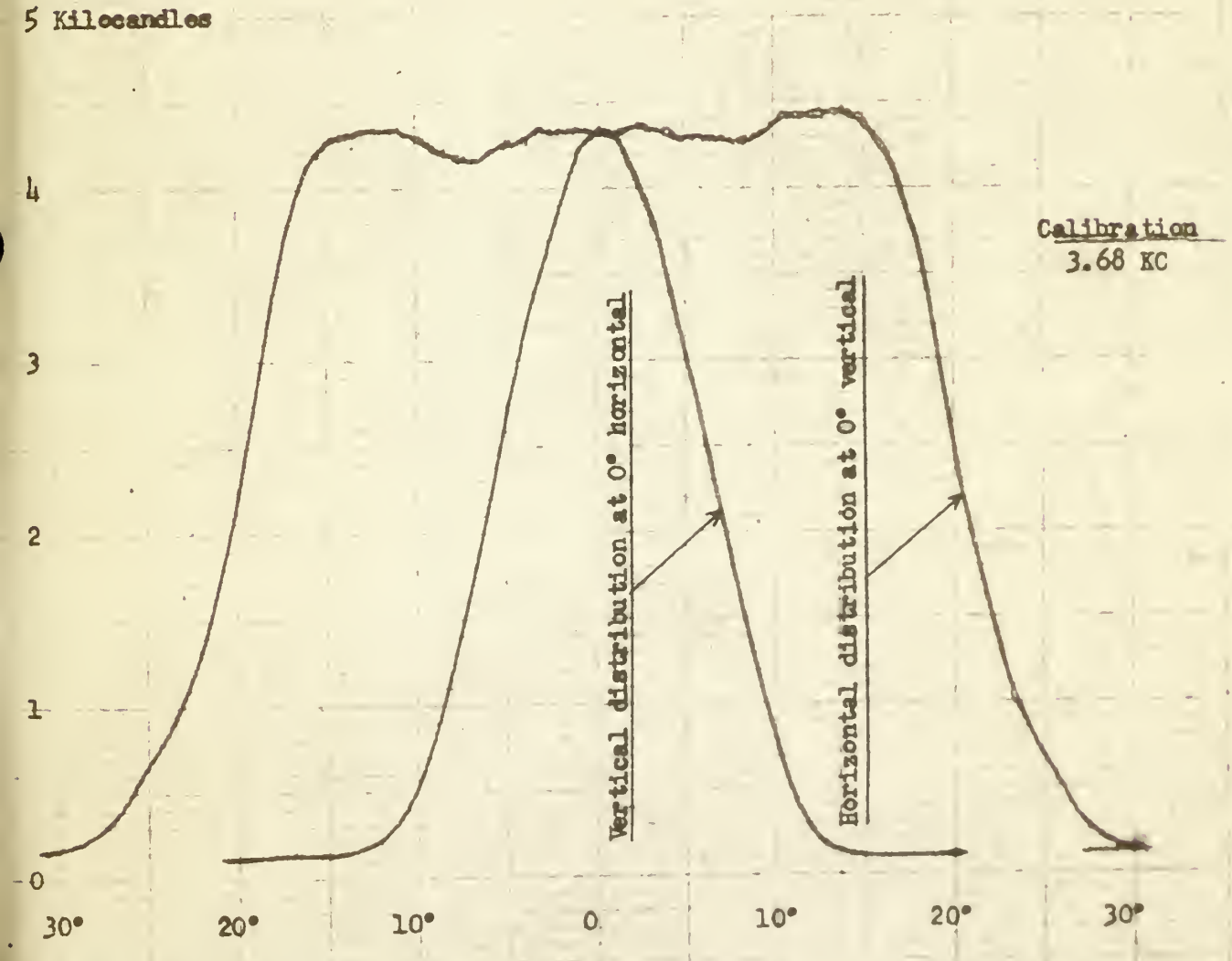

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Figure 2

LAMP FOR LEAD-IN SYSTEM

HORIZONTAL AND VERTICAL CANDLEPOWER DISTRIBUTIONS

as recorded by photometer

Lamp No. 8

Lamp: 100-PAR
Bulb: PAR 56
Lens: Type 399 PAR 56
Rated: 100 Watts, 115 Volts

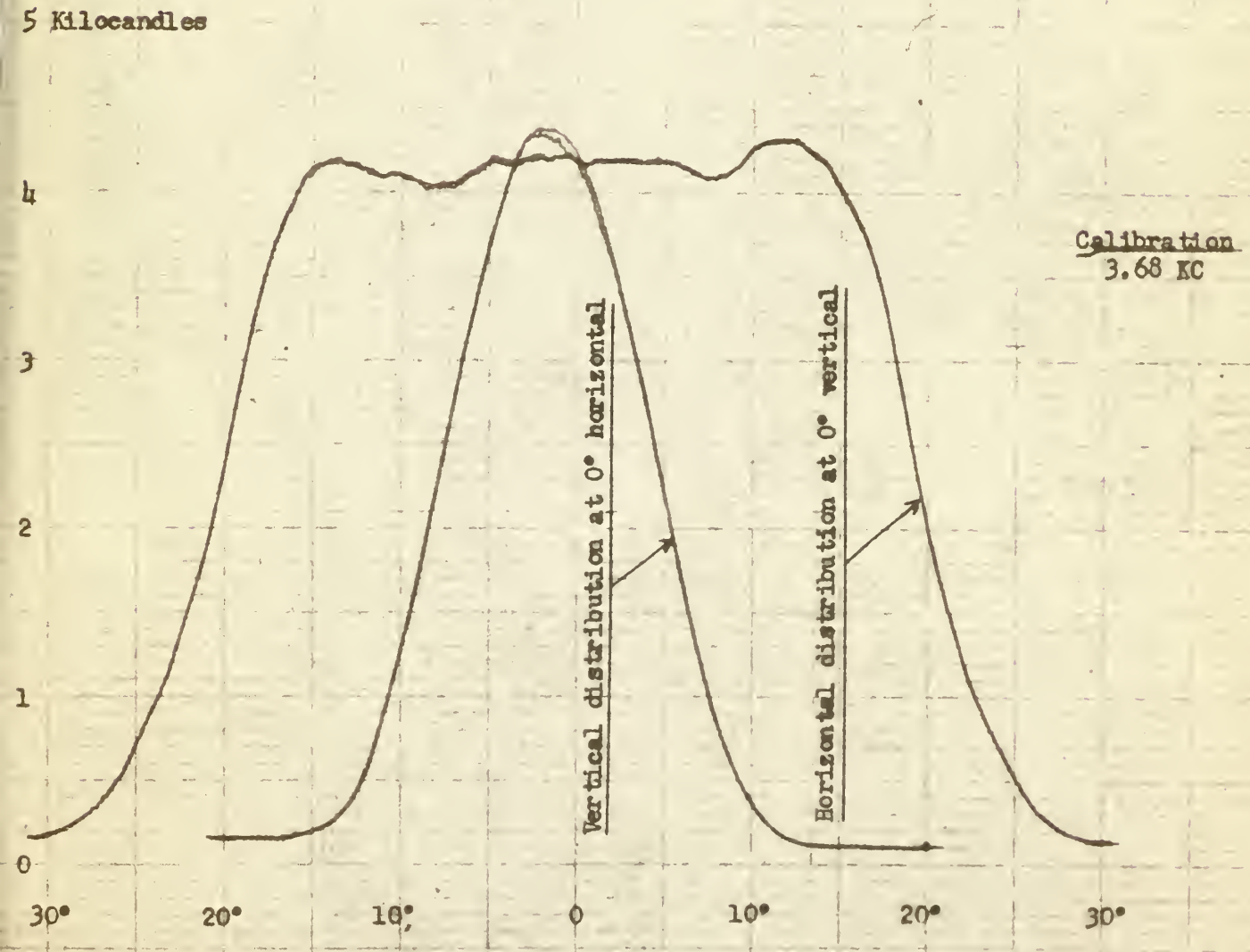

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Figure 3

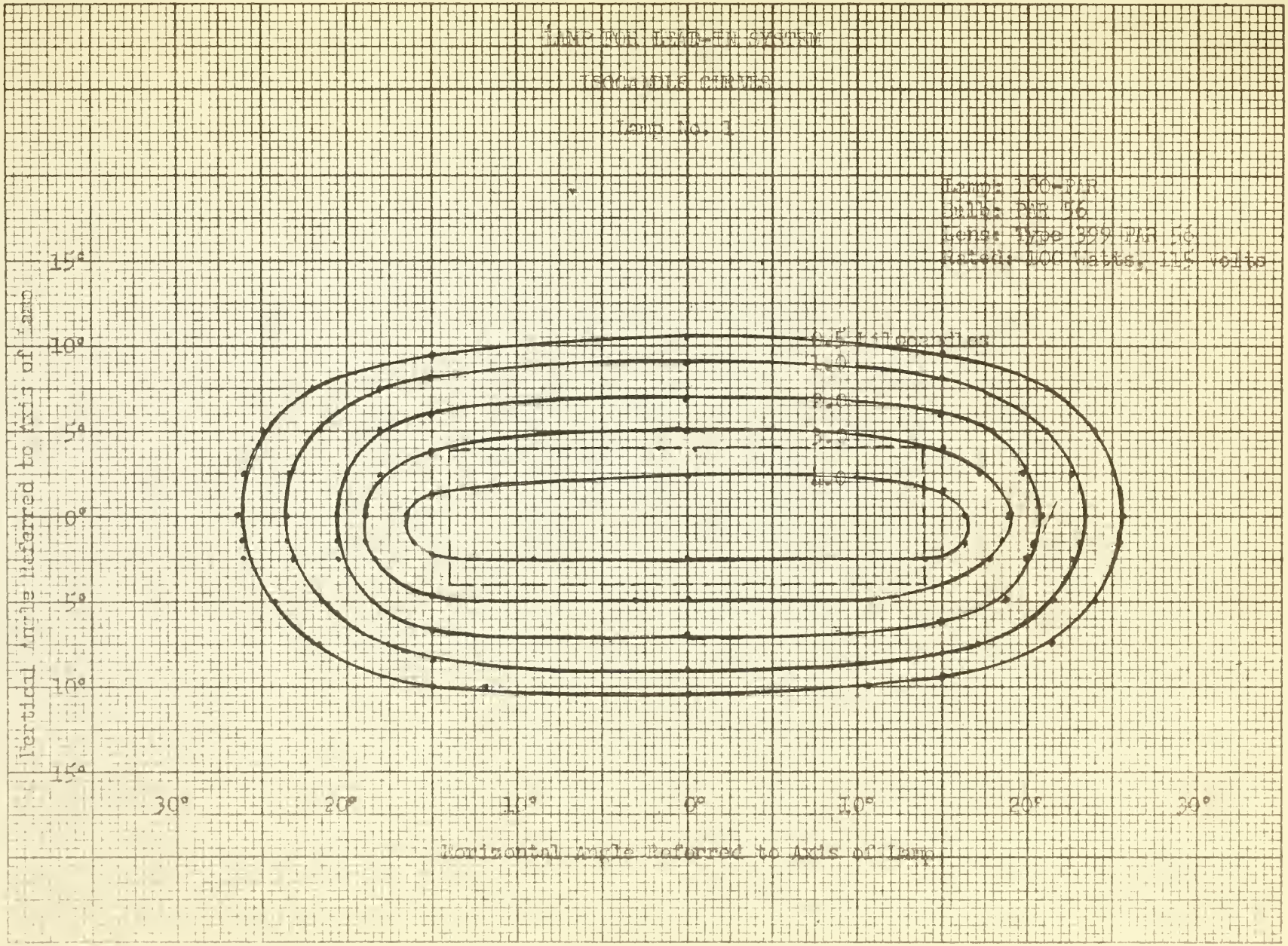

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Figure 4

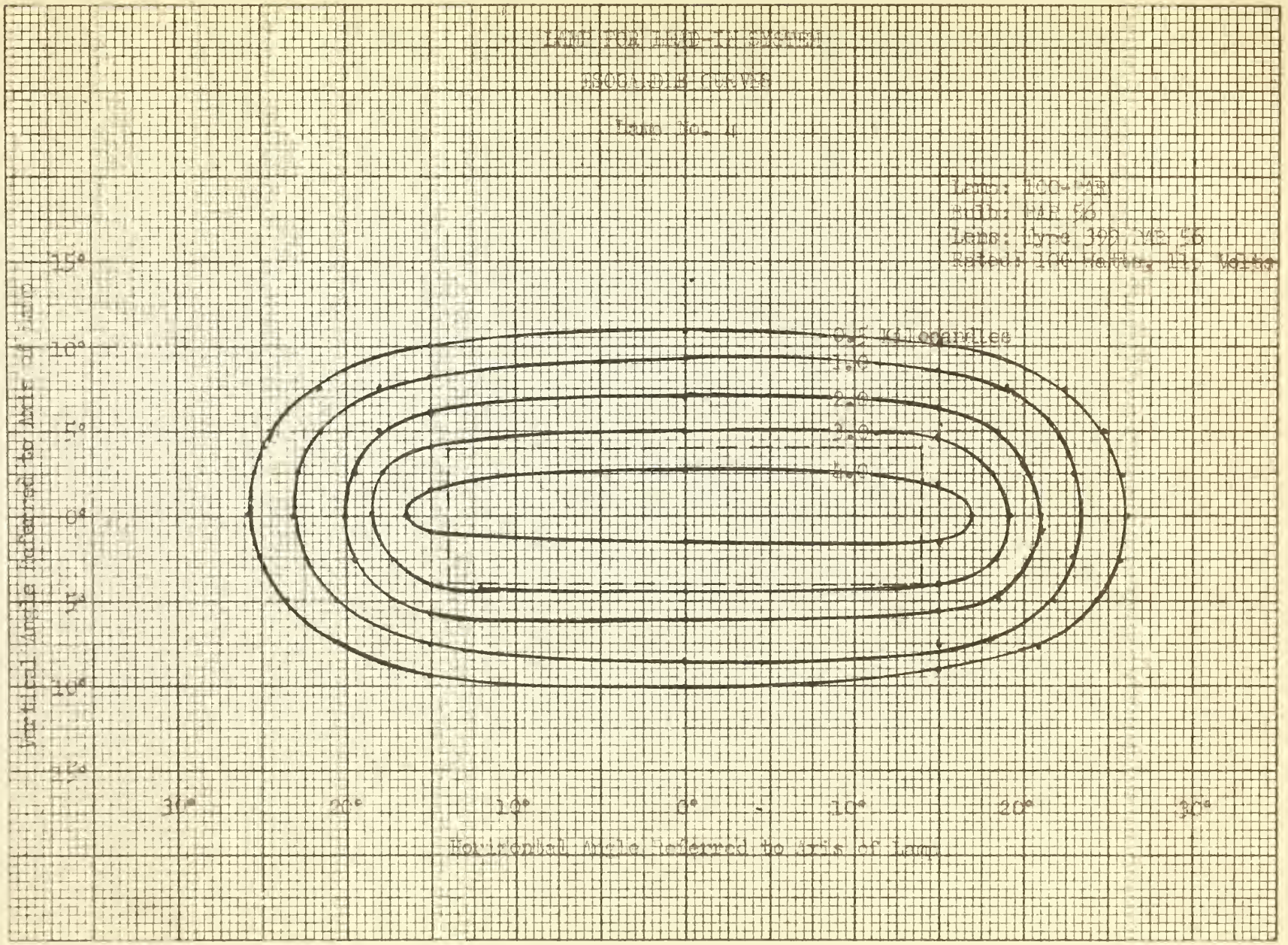

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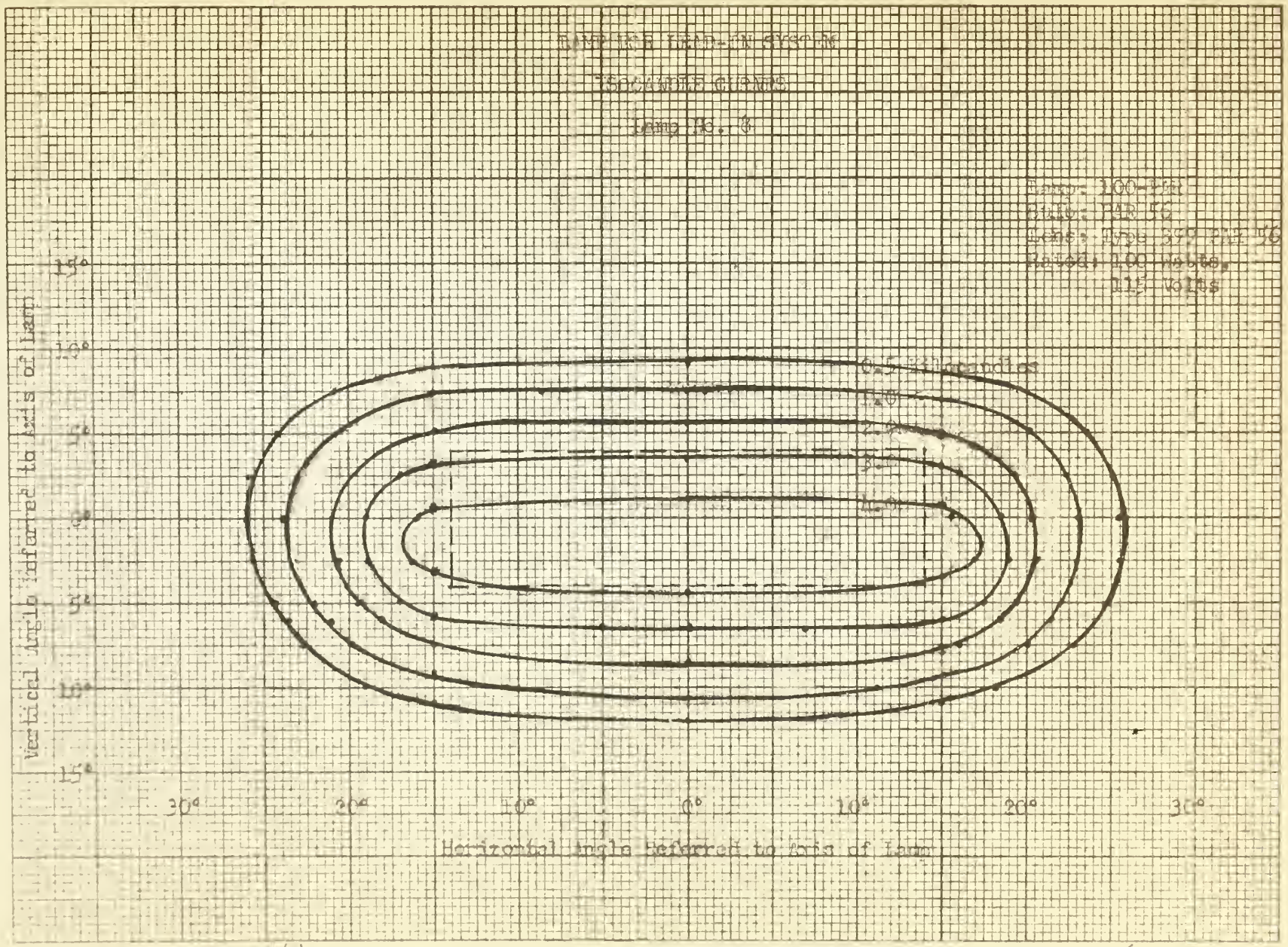
Figure 5



Test 214-12/56

Figure 6

THE NATIONAL BUREAU OF STANDARDS

Functions and Activities

The functions of the National Bureau of Standards are set forth in the Act of Congress, March 3, 1901, as amended by Congress in Public Law 619, 1950. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to Government Agencies on scientific and technical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes, and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. A major portion of the Bureau's work is performed for other Government Agencies, particularly the Department of Defense and the Atomic Energy Commission. The scope of activities is suggested by the listing of divisions and sections on the inside of the front cover.

Reports and Publications

The results of the Bureau's work take the form of either actual equipment and devices or published papers and reports. Reports are issued to the sponsoring agency of a particular project or program. Published papers appear either in the Bureau's own series of publications or in the journals of professional and scientific societies. The Bureau itself publishes three monthly periodicals, available from the Government Printing Office: The Journal of Research, which presents complete papers reporting technical investigations; the Technical News Bulletin, which presents summary and preliminary reports on work in progress; and Basic Radio Propagation Predictions, which provides data for determining the best frequencies to use for radio communications throughout the world. There are also five series of nonperiodical publications: The Applied Mathematics Series, Circulars, Handbooks, Building Materials and Structures Reports, and Miscellaneous Publications.

Information on the Bureau's publications can be found in NBS Circular 460, Publications of the National Bureau of Standards ($1.25) and its Supplement ($0.75), available from the Superintendent of Documents, Government Printing Office. Inquiries regarding the Bureau's reports and publications should be addressed to the Office of Scientific Publications, National Bureau of Standards, Washington 25, D. C.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