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Enclosed are three copies of Technical Report No. 9 on the above-referenced contract.

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WB:aq

Enclosures: Technical Report No. 9 (3 copies)

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cc: [redacted]
Successor Contracting Officer
(2 copies)

Approved For Release 2002/06/17 : CIA-RDP78B04747A000700050016-3

[redacted]

Technical Report No. 8

Government Contract [redacted]

[redacted]

A. <u>Current Status of Work</u>

During this period the sine wave tester was completely assembled and thoroughly tested. The tests were made on [redacted] microscope objectives stopped down to very small numerical apertures to make their performance diffraction limited. This mode of testing is very difficult since the amount of light available in the final image is very small and visual settings become very difficult. Under these conditions we also encountered the difficulty that the depth of focus is very large, thus causing the grain in the ground glass in the sine wave tester to become objectionable. To To see if the equipment was otherwise working correctly a great number of measurements were made and the results averaged. This resulted in some startling information and indicated that there was another factor influencing the results. For a long period of time this problem remained unexplained. It was finely traced to two causes: balancing of the two beams and scattering in the polarizers. The balancing of the two beams could easily be corrected after a better adjustment procedure was worked out. The scattering of the light in the polarizers was a more fundamental problem. Since we were already using the best polarizers available, we could not really hope for a great improvement here. However, by carefully selecting the pieces to be used from a large quantity of polarizers some improvement could be made. Some scattering will always be present, even with the best selected polarizers. From theory it follows that this would not be a serious difficulty, and the result from theoretical computations indicated that it could be callibrated out easily, resulting in a slightly different curve representing the visibility of the image produced by the tester as a function of the angle of the polarizer. The greatest effect would be a reduction in the maximum visibility for an angle zero. Instead of a visibility of 1, we would have a visibility of minimum .95. Many measurements were made to verify these theoretical results. All our measurements indicate an agreement of measurements with theory.

To improve the light intensity, the illumination of the two beams was modified and condensing systems were included. The light diffusers in the two beams were also modified. Here we had the problem that in order to diffuse the light sufficiently one must use ground glass of enough coarseness to scatter the light properly; this, however, leads to the problem that the structure of the ground glass would become visible during the measurements on systems with a large depth of focus. Moving the ground glass far enough away from the target to overcome this problem would lead to a large reduction in the light intensity in the two beams. To overcome this problem we introduced a different type of light diffuser. This diffuser consists of a glass plate ground on both sides. One side is ground with an extremely fine abrasive, which results in a structure that would not be objectionable during the measurements, but would by itself not diffuse the light sufficiently. The other side of the glass is ground with a much coarser abrasive. This provides the necessary diffusion, while the first side provides the smoothness. This combination leads to a diffuser of the desired quality, both in smoothness and high light intensities.

Because of all the modifications made during this period, we felt that the resulting sine wave tester was too make-shift to be delivered as a final instrument. It was therefore decided to build a new one, incorporating all the new features. This re-building is now in progress and should be completed in the next few weeks.

We feel confident that we will now have an instrument with the desired properties and precision.

B. Problem Areas Encountered

The problem areas encountered are described in Section A.

C. Projected Work for Next Monthly Period

The final instrument will be finished and fully calibrated. Then work will start on the second model.

D. Status of Funds Expended

From the period of August 1, 1966 to December 31, 1966 the sum of [redacted] was spent on subject contract. This figure includes direct labor, materials, overhead and G & A.

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E. <u>Documentation of any verbal committments and/or agreements with the Technical Representatives of the Contracting Officer during the reporting period.</u>

No verbal agreements or committments were made during this period.

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Submitted by: [redacted]

8 March 1967

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