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FOURTH LETTER REPORT ON EVALUATION (U)

(14 February 1966 to 14 March 1966)

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Letter Report on Evaluation (U)

I. Work for Reporting Period

During the past month the two pinhole interferometer was completed, some experiments performed, and the results evaluated. The arrangement was a pair of 50 micron diameter pinholes separated about 500 microns apart in the object plane. The laser was in all cases operated in single mode. The first experiment was to remove the ground glass completely and examine the contrast of the fringes produced. As expected the fringes were very high contrast indicating a high degree of spatial coherence for this pinhole separation. The next case consisted of replacing the ground glass in its regular position in front of the laser but not permitting it to rotate. An auxiliary lens was used to focus the laser beam into a small spot on the ground glass surface. The fringes were again found to be high contrast indicating that the unevenness of the stationary ground glass surface did not appreciably reduce the spatial coherence for this pinhole separation. As the spot size on the ground glass was increased by slightly defocussing the lens the fringe contrast remained high.

However, in the next part of the experiment the ground glass was rotated as it would be operationally. We found that in this case the contrast of the fringes was reduced considerably for both the focussed and defocussed spot illumination indicating that the rotating ground glass in effect reduces the spatial coherence of the laser illumination.

Therefore, in the situation in which the enlarger was intended to be used, the rotating ground glass is acting to reduce the spatial coherence of the object illumination.

To parallel this work images of [redacted] "L" targets were made for each of the above cases. The effects which one would expect on the basis of the interferometer measurements were observed. In the extremely coherent (high fringe contrast) cases a phase reversal was observed in the images. The less coherent cases produced fewer artifacts such as edge ringing and dust particle effects but also reduced the contrast of the object at the same time. 25X1

II. Work for Next Period

During the coming month we will experimentally and analytically examine the images of edges of various contrasts. Very high acuity edges have been obtained for this work. They were made with an electron beam apparatus and are much sharper than an edge produced photographically. Further direct measurements of the spatial coherence in the object plane will be made.

III. Visits to Contractor

No visits were made to the contractor during the reporting period.

IV. Changes in Personnel

None

V. Progress of Work

As of this reporting data approximately 25% of the work program has been completed and 25% of the contract funds have been expended. Now that the enlarger checkout, camera back modifications , and computer programming are essentially completed we expect that the completion rate will be substantially increased. No delays in completing the contracted program within funds or within specified completion dates are anticipated.