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December 31, 1965

Monthly letter progress report - Contract



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LOG OF ACTIVITIES

Wednesday, Dec. 1, 1965

Preparation of reports. (Principal Associate, 1 day, Task II)

Thursday, Dec. 2, 1965

Preparation of reports. (Principal Associate, 1/2 day, Task II)

Monday, Dec. 6, 1965 through

Friday, Dec. 10, 1965

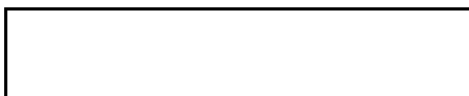
Visitation to Washington, D.C. office of Technical Representative of Contracting Officer for orientation and briefing. (Principal Associate, 4 1/2 days, Task I)

Monday, Dec. 20, 1965 through

Friday, December 31, 1965

Analytical work on Laser Metrology: literature review, atmospheric effects, quantum noise effect, wavelength determination, vibration, spectral purity. (Two Principal Associates, Task II)

- Monday 12/20 1 day
- Wednesday 12/22 1 day each
- Thursday 12/23 1 day each
- Friday, 12/24 3/4 day each
- Monday 12/27 1 day
- Tuesday 12/28 1 day
- Wednesday 12/29 1 day
- Thursday 12/30 1 day
- Friday 12/31 1/2 day



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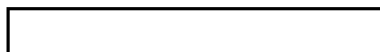
Declass Review by NGA.

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Comments on Status

Task I - Item 1 "Special Investigations"

A visitation was made to the Washington, D. C. office of the Technical Representative of the Contracting Officer for orientation and briefing.

Task II - Item 3 "Laser Metrology"

The analytical work on the use of the helium-neon gas laser for measuring engine applications has brought to light some interesting facts. For measurement accuracy on the order of 1/4 to 1/2 micron over distances of 1/2 to 1 meter, it appears that:

- (a) The length measured must be corrected for the changes in the wave-length of the laser light caused by changes in barometric pressure.
- (b) Correction must also be made for changes in air temperature.
- (c) Correction for changes in relative humidity of the air need not be made except for extreme conditions.
- (d) The spectral purity and wave-length stability of the  Model 119 servo controlled helium-neon gas laser are more than adequate for the measurement requirement.
- (e) The intensity of the laser beam is great enough so that photon quantum noise will not limit slowing rates up to 10 inches per second, or more.

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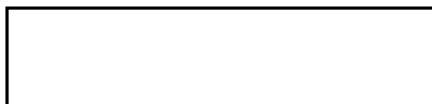
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COMMENTS ON SEARCH (CONTINUED)

December 31, 1965

- (c) Mechanical vibrations of the measuring elements may have significant effect and may limit the performance level of the measuring instrument. The effect of vibration levels are intimately related to the frequency response and electrical noise levels of the electronic amplifiers and the photo electric sensors. Electrical noise and mechanical vibration are in some respects indistinguishable in their contribution to output errors. Further work is being done to estimate the measuring error produced by mechanical vibration and electrical noise.
- (e) No fundamental limitation has appeared to prohibit the application of the laser interferometer to this measurement problem. This is evidenced by the successful operation of the Bureau of Standards single axis measuring instrument. The laser interferometers in use have undesirably slow slowing rates. It is probable that an extensive design and development program would be required to produce a 2-axis laser interferometer with adequate frequency response, vibration tolerance and dependability. The significant technical advantages of the simple laser interferometer over the linear phase shifter or the fringe grating are not immediately apparent.



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