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13 January 1966

EVALUATION OF FINAL REPORT ON PAR 217

Declass Review by NGA.

Background

X1 PAR 217 of Contract [ ] was concerned with the optimization of the laser for photographic purposes. Its basic task was to explore the production of 0.5 micron wavelength (blue-green) laser radiation by harmonic doubling in certain bi-refrangent crystals, those of ammonium di-hydrogen phosphate (ADP) and potassium di-hydrogen phosphate (KDP). [ ] undertook the problem on 2 March 1964 and completed the work on 12 October 1965 at a cost to the Government of [ ]. The primary objective of this program, as defined at the outset by [ ] was "a final report discussing in detail all investigation and tests accomplished." Special emphasis was to be placed upon reporting: (1) the knowledge gained regarding the combination of a laser with a harmonic doubling crystal element as a source of coherent, visible light radiation; (2) the data organized regarding the use of the laser with a variety of photographic sensitized materials; and (3) recommendations regarding the breadboarding and building of prototype equipment to support the photo-exploitation community.

Evaluation

X1 1. An entirely accurate appraisal of the worth of this contract and its final report will be most difficult to make. Due to concurrent advances in the state-of-the-art regarding lasers, several aspects of the prescribed course of study became unavoidably obsolescent during the contract period, while other features retained their original significance throughout. In particular, the development of an operational, continuous wave, gas laser, which radiated in the blue-green wavelength area virtually eliminated the necessity of resorting to the harmonic doubling process with its consequent flicker fusion of discrete pulses from the neodymium-doped, borate glass laser. In view of the above unforeseen circumstances, it would be both unfair and inaccurate to judge [ ] work solely upon an absolute value basis. Their work will be evaluated according to the successes and/or failures experienced in approaching their objectives as originally stated.

2. The final report does not reflect inputs from other sources associated with similar studies; a literature search in the required depth would have helped the study.

3. The laboratory-oriented portion of the study was a competent effort as far as it went. Unfortunately, it was cut short by the unreported

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Evaluation, continued.

re-allocation of equipment to another project during the re-examination of the goals on this program. Prior to that time, [ ] had successfully completed the initial, mechanical problem-solving stage in achieving operation of the glass laser with harmonic doubling element. Aside from a theoretical error in some crystallographic considerations and the consequent backtracking in experimental procedure, this phase of the contract seems to have progressed well with some meaningful results. In fact, its description occupies the bulk of the Final Report. Subsequent to this phase were scheduled the photographic tests which promised to yield the results of greatest potential interest to us. These tests, involving image quality and a variety of sensitized materials, however, were virtually eliminated by [ ] all because of rather tentative findings obtained from PAR 216. The lone area to receive any detailed attention was that of beam uniformity, only preliminary results were obtained, however, and no significant quantitative parameters or probable causes could be determined. That the beam would vary in spatial intensity was expected; the correction of this phenomenon is a real photographic concern and a known problem area.

4. [ ] discussion of the conversion efficiency aspects of the second harmonic technique for the generation of visible, coherent radiation is valid. The necessity of such a high energy, low efficiency method of lasing has become outmoded, however, and even at the time of this contract, [ ] sole recommendation that we expect a moderately priced, continuous wave, blue-green, gas laser soon to be commercially available was a foregone conclusion.

SECRET

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