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TEXTRON Defense Systems

Textron Defense Systems/
Subsidiary of Textron Inc.

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4 November 1991

Naval Research Laboratory
Attn: Mr. Barry Feldman, Code: 6540
4555 Overlook Avenue, SW
Washington, DC 20375-5001

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Subject: Contract No. N00014-91-C-2279
Monthly Progress Report - October 1991

Dear Mr. Feldman:

In accordance with the 91-C-2279 contract, *Textron Defense Systems (TDS) hereby forwards one copy of the subject report. Additional distribution has been made to the offices set forth below, per Enclosure 1 of the DD Form 1423.

Very truly yours,

Textron Defense Systems

C. T. Christiano

C. Thomas Christiano
Manager of Contracts

CTC/hga
3730D
Enclosure

cc: Director
Naval Research Laboratory
ATTN: Code 4827
Washington, DC 20375-5000, (1 copy)

✓ Defense Technical Information Center
Bldg. 5, Cameron Station
Alexandria, VA 22314, (4 copies)

Defense Contract Management Area Operations
495 Summer Street, Boston, MA 02210-2184
Attn: GFACB-23/Mr. David Noyes
Administrative Contracting Officer, (1 copy)

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Laser Frequency Multiplication
Report for October 1991, Contract No. 00014-91-C-2279

The available Lumonics TEA CO₂ lasers (gain lengths 40 cm and 120 cm) have been mounted on an optical table and preparation of the mode-locked, line-selected output has begun. The 0.5 μsec TEA laser pulse was considered to be too short for effective mode-locking so its pulser was modified into a simple three-element PFN to give 3 μsec excitation. Single transverse mode operation was obtained with the 40 cm device in a folded 6m optical cavity, giving an output energy of 0.5 J in a Gaussian spot of parameter $\omega=0.46$ cm. A continuous - wave CO₂ laser was grating tuned to 9.55 μm and injected at the 0.1 watt level into the pulsed oscillator in order to frequency lock its output and at the same time suppress the gain-switched "spike". This exercise was successful, even without using a mode-matching lens of 5 m focal length which is on order. Suppression of the gain-switched spike is important for our study of harmonic conversion efficiency.

The output envelope at this point is unacceptably erratic, possibly due to air movement in the resonator beam path. Further effort will be made to improve the output reproducibility.

A 12.5 MHz germanium crystal modulator was inserted into the cavity to obtain preliminary 9.55 μm, TEM₀₀ mode-locked pulse trains, of total duration 3 μsec and with 40 nsec between individual pulses. Further mode-locking work will be done when the output power of the laser has been made more constant.

A 35 mm type I AgGaSe₂ crystal has been ordered from Cleveland Crystals, to be cut and coated for frequency doubling from 9.55 μm to 4.775 μm. A quotation is being sought on a type II mixing crystal to give 3.183 μm, following the doubling process. The type I crystal is scheduled for delivery by Dec. 15.

Malcolm McGeoch 10/31/91

Statement A per telecon Barry Feldman
NRL/Code 6540
Washington, DC 20375-5000

NW 11/19/91



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