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FINAL REPORT

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JUN 10 1992
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Grant Title: Growth, Characterization and Applications of β -Barium Borate and Related Crystals

Grant Number: N00014-90-J-2016

Period of Performance: June 1, 1990 - May 31, 1991

Dollar Amount: \$70,000

Scientific Officer: John McMahon
Naval Research Laboratory
4555 Overlook Avenue
Washington, DC 20375

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Final Report to NRL on
Growth, Characterization, and Applications of
 β -Barium Borate and Related Crystals

(1990 to 1991)

Submitted by

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Emphasis of our program during the past year has been on improving the size and quality of β -barium borate (BBO) crystal, develop the growth recipe for lithium triborate crystal (LBO), characterization of LBO, develop BBO optical parametric oscillators, and finally help establish commercial sources of these crystals. Progress was made in all these areas.

First, on the BBO crystal growth technology, we have now succeeded in growing relatively large single crystals of good quality [see Figure 1]. The technology have now been transferred successfully to Cleveland Crystals Inc. They are now the first and only commercial source of domestically produced BBO crystals in this country and our program is receiving royalty income from their sales to support our research effort.

Second, on the LBO crystals, we have succeeded in growing modest sized single crystals [see, Figure 2]. These are probably among the largest grown in this country. Detailed characterization of the grown crystals have been carried out and the results have either been published or are being published. These include the precise determination of the phase-matching conditions for second-harmonic generation in LBO, evaluation of the use of LBO for second-harmonic generation of femtosecond optical pulses, etc.

Finally, on BBO OPO, we have completed construction of an OPO with computer-controlled tuning for the Army. Cornell University has also signed a licensing agreement with a company [LasSen of Las Cruz, NM] to commercialize the OPO technology developed in our laboratory and we are beginning to draw royalty income from this commercial effort also. We believe that with suitable nonlinear optical crystals, the OPO technology is finally poised for take-off commercially. The work done in our laboratory has contributed substantially to this development.

Figure Captions

Figure 1 - Photograph of as-grown β -Barium Borate crystal.

Figure 2 - Photograph of as-grown LiB_3O_5 crystal.

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Statement A per telecon John MC Mahon
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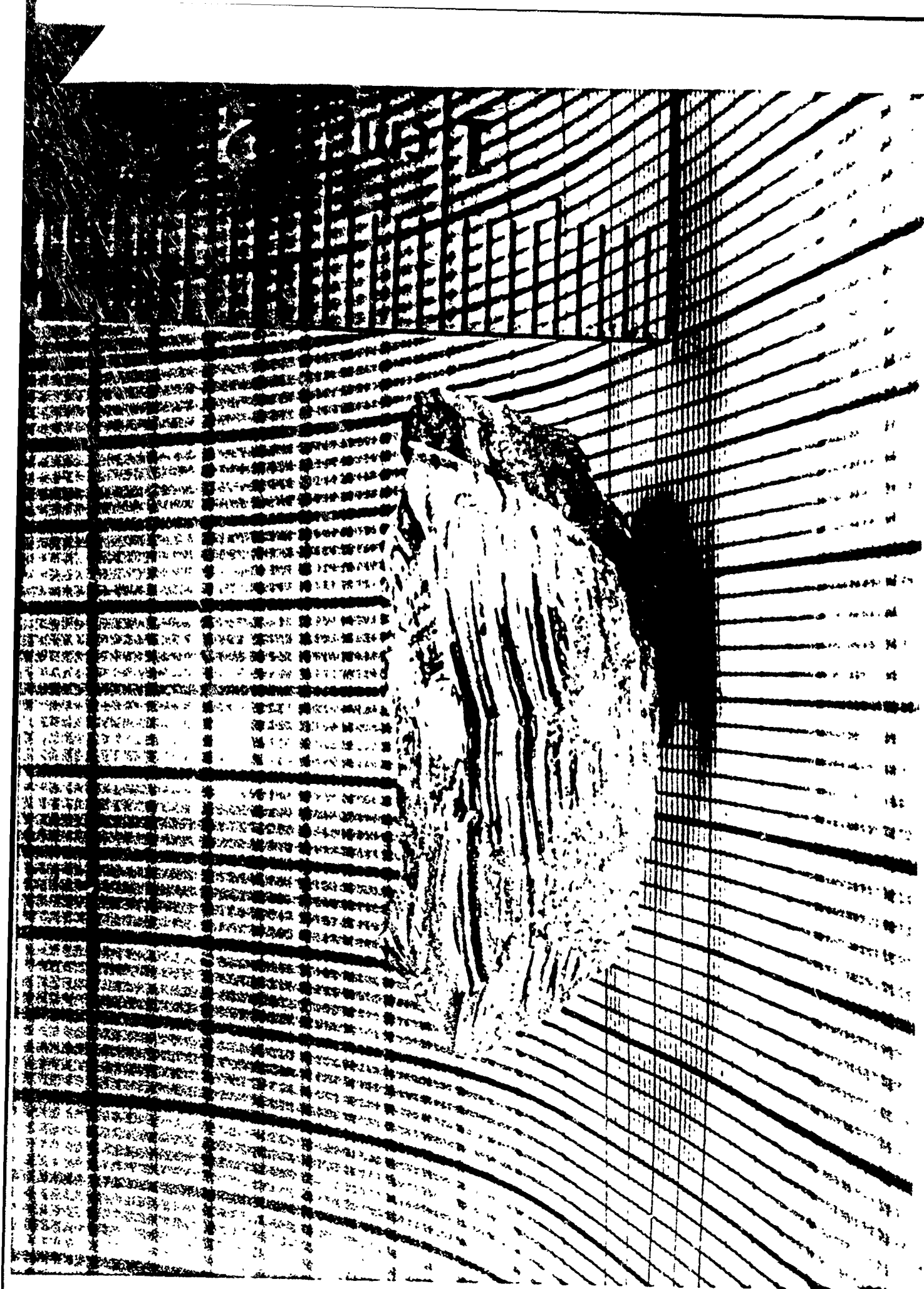


Figure 2

Appendix - List of Publications

1. "Growth and characterization of nonlinear optical crystals suitable for frequency conversion", L. K. Cheng, W. R. Bosenberg, and C. L. Tang, Prog. Crystal Growth and Charact. Vol. 20, 9-57(1990).
2. "Measurements of noncritically phase-matched second harmonic generation in a LiB_3O_5 crystal", T. Ukachi, R. Lane, W. Bosenberg, and C. L. Tang, App. Phys. Lett., Vol. 57, 980(Sept. 1990).
3. "Growth of large, high-quality beta-barium borate crystals", W. Bosenberg, R. Lane, and C. L. Tang, J. of Crystal Growth, Vol. 108, 394-398(1991).