

UNCLASSIFIED

AD NUMBER	
AD046163	
CLASSIFICATION CHANGES	
TO:	unclassified
FROM:	confidential
LIMITATION CHANGES	
TO: Approved for public release; distribution is unlimited.	
FROM: Distribution authorized to DoD only; Administrative/Operational Use; AUG 1954. Other requests shall be referred to Bureau of Ships, Washington, DC 20350. Pre-dates formal DoD distribution statements. Treat as DoD only.	
AUTHORITY	
BUSHIPS ltr dtd 1 Apr 1968; BUSHIPS ltr dtd 1 Apr 1968	

THIS PAGE IS UNCLASSIFIED

Armed Services Technical Information Agency

Because of our limited supply, you are requested to return this copy WHEN IT HAS SERVED YOUR PURPOSE so that it may be made available to other requesters. Your cooperation will be appreciated.

AD 46163

NOTICE: WHEN GOVERNMENT OR OTHER DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE U. S. GOVERNMENT THEREBY INCURS NO RESPONSIBILITY, NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

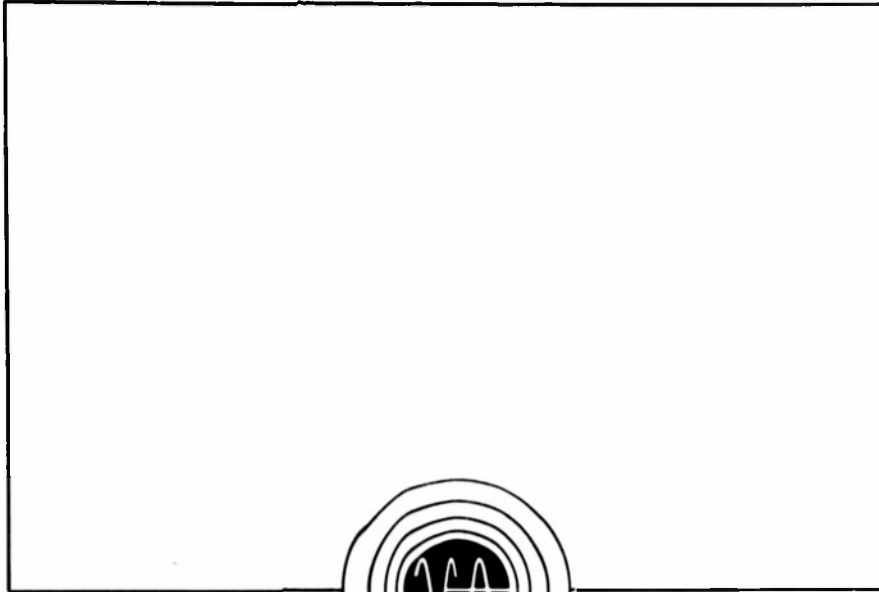
**Reproduced by
DOCUMENT SERVICE CENTER
KNOTT BUILDING, DAYTON, 2, OHIO**

CONFIDENTIAL

CONFIDENTIAL

AD No. 46163

ASTA FILE COPY



~~REPRODUCTION IS AUTHORIZED ONLY TO~~
~~MILITARY AGENCIES.~~

VARIAN

associates

NOV 27 1954

54AA 73195
CONFIDENTIAL

25956



CONFIDENTIAL

Engineering Report
No. 101-29

Copy No. 1

**FURTHER DISSEMINATION IS AUTHORIZED ONLY TO
MILITARY AGENCIES.**

**VA-158 KLYSTRON OSCILLATOR
DEVELOPMENT PROGRAM**

Progress Report for
August 1954

Prepared for: Bureau of Ships
Navy Department

On: Contract No. N0bsr-52503
Index No. NE-110420

By: Peter H. Kafitz

Approved: _____

SF Varian
Sigurd F. Varian
Vice-President for Engineering

10180677-54

54AA

73195

Page 1 of 1

CONFIDENTIAL



CONFIDENTIAL

PURPOSE

The original purpose of the program covered by BuShips Contract No. NObsr-52503 was to develop a rugged local oscillator to comply with the Bureau of Ships Contract Specifications SHIPS-O-419, dated 15 March 1951, which was subsequently modified at a conference held at the Bureau of Ordnance, Washington, D.C. on 20-21 May 1952 and later at a conference held at Varian Associates on 29-30 September 1952. The tube was to be a reflex klystron operating in the frequency range from approximately 8.5 to 9.6 kmc, and its performance was to be similar to the 2K25 except for severe restrictions on frequency drift with temperature, frequency change due to shock, and FM noise due to vibration.

An amendment to Contract No. NObsr-52503 executed on 10 July 1953 changed the scope of this contract to incorporate additional development work, as follows:

I. Additional design work in connection with the prototype tube meeting the "1000-Tube Production Refinement Order Specification."

II. Long-range extended development including:

- A. Broadband matching to load: Elimination of the matching screw in the output iris to simplify the use of the tube.
- B. An investigation to improve repeller or modulation sensitivity and reduce sensitivity variations over the frequency range and from tube to tube.
- C. Elimination of undesirable modes.
- D. An increase in mechanical tuning range from 8.8 - 9.6 kmc to 8.5 - 9.6 kmc.

The product of the extended development program was designated the VA-158, to differentiate it from the V-52 developed on the original contract.

Page 2 of 4

CONFIDENTIAL



CONFIDENTIAL

The latest amendment to Contract No. NObsr-52503 was executed on 2 June 1954 and calls for still further electronic and mechanical improvements in VA-158. To meet the extended development requirements, the electronic tuning range must be substantially increased. The variation in reflector voltage sensitivity over the tuning range, and from tube to tube, must be reduced. Electronic performance should also be improved to increase the production yield in other respects, including power output and hysteresis. Other factors requiring study include variation of performance with gas pressure in the tube and filament voltage stability.

To accomplish all of the needed electronic improvements, it appears that a substantial redesign of the electron optical system is required. Such a design is being developed for other klystrons, and information obtained from that work can be adapted to improve the VA-158. The resulting performance should be significantly superior.

After the completion of the above electronic improvement program, work will be directed toward further simplification and ease of tuning.

At the conclusion of this program, six (6) sample tubes will be delivered representative of the engineering progress.

PROGRESS

For the reasons outlined in the last report¹, it was decided to redesign the tuning mechanism as the initial step in the extended development of the VA-158. A very smooth, non-microphonic tuner was developed which was satisfactory in all respects except life. During the past month, work was continued along this line, and after trying a number of combinations of materials, the life problem appears to be solved. The improved tuner is mechanically the same as that shown in Figure 1 of

- - - - -

1 Varian Engineering Report No. 101-28

CONFIDENTIAL



CONFIDENTIAL

the previous report . The extended life was achieved by giving the tuning shaft a highly polished chrome plate and making the female portion of the bearing of bronze. A very light application of molybdenum disulfide serves as a lubricant without adversely affecting the Q of the resonator.

Two tubes with the new tuner have been cycled over their full tuning range for more than 5000 cycles without change in performance. These tests are continuing.

PROGRAM FOR NEXT INTERVAL

During the next interval, the design of the improved electron optics, which constitutes the main objective of this program, will be started.

Estimated expenditures during August 1954: \$2,585.00

Estimated man-hours during August 1954: 286

Page 4 of 4

CONFIDENTIAL



CONFIDENTIAL

Contract No. NObsr-52503 - Index No. NE 110420

Subject: VA-158 Klystron Oscillator Development Program

DISTRIBUTION LIST

<u>Copy No.</u>	<u>Quantity</u>	<u>Address</u>
1 - 2	2	Director Evans Signal Laboratory Belmar, New Jersey Attn: Thermionics Branch
3 - 6	4	Chief, Bureau of Ships Department of the Navy Washington 25, D. C. Attn: Code 816
7 - 8	2	Chief, Bureau of Ships Department of the Navy Washington 25, D. C. Attn: Code 327
9 - 10	2	Chief, Bureau of Ships Department of the Navy Washington 25, D. C. Attn: Code 836
11	1	Director Naval Research Laboratory Anacostia 20, D. C. Attn: Code 2000
12 - 13	2	Commanding General Wright Air Development Center Attn: Code WCESO 2 Wright-Patterson Air Force Base Dayton, Ohio For the Commanding General
14	1	Panel on Electron Tubes Room 601 - 139 Centre Street New York 13, New York Attn: A. Lederman
15	1	National Bureau of Standards Department of Commerce Washington 25, D. C. Attn: R. E. Dorrel

Page 1 of 4

CONFIDENTIAL



CONFIDENTIAL

Contract No. NObsr-52503 - Index No. NE 110420

Subject: VA-158 Klystron Oscillator Development Program

DISTRIBUTION LIST

<u>Copy No.</u>	<u>Quantity</u>	<u>Address</u>
16 - 17	2	Chief, Bureau of Aeronautics Department of the Navy Washington 25, D. C. Attn: EL-54
18	1	Inspector of Naval Material P.O. Box 3364 San Francisco 19, California
19	1	Director, Applied Physics Laboratory Johns Hopkins University 8621 Georgia Avenue Silver Spring, Maryland VIA: NIO, Applied Physics Laboratory Johns Hopkins University 8621 Georgia Avenue Silver Spring, Maryland
20	1	Bendix Aviation Corporation Bendix Products Division 400 Beiger Street Mishawaka, Indiana VIA: NIO, Bendix Products Division 400 South Beiger Street Mishawaka, Indiana
21	1	Capehart-Farnsworth Corporation Fort Wayne, Indiana Attn: Mr. W. Hawkins VIA: INSMAT, 3802 S. Calhoun Street Fort Wayne, Indiana
22	1	Consolidated Vultee Aircraft Corporation San Diego 10, California Attn: Mr. J. L. Bowers VIA: NIO, Consolidated Vultee Aircraft Corporation San Diego, California

CONFIDENTIAL



CONFIDENTIAL

Contract No. NObsr-52503 - Index No. NE 11042C

Subject: VA-158 Klystron Oscillator Development Program

DISTRIBUTION LIST

<u>Copy No.</u>	<u>Quantity</u>	<u>Address</u>
23	1	Massachusetts Institute of Technology Cambridge, Massachusetts Attn: Prof. H. Zimmerman VIA: DCO, Massachusetts Institute of Technology Cambridge, Massachusetts
24	1	Naval Research Laboratory Washington, D. C. Attn: Mr. A. H. Locke
25	1	Sperry Gyroscope Company Division of Sperry Corporation Great Neck, L.I., New York Attn: Mr. S. J. Korn VIA: INSORD, 31-10 Thomson Avenue Long Island City, New York
26 - 28	3	Chief, Bureau of Ordnance Department of the Navy Washington 25, D. C. Attn: Re9a, Re9b, Ad3
29	1	Director, Corona Laboratories National Bureau of Standards Corona, California Attn: Mr. W. L. Christiansen
30	1	Fairchild Engine & Aircraft Corp. Guided Missiles Division Farmingdale, L.I., New York Attn: Mr. K. W. Marsh VIA: Naval Inspector of Ordnance Long Island City, New York
31	1	Glenn L. Martin Company Middle River, Maryland Attn: Mr. R. W. Wells VIA: Bureau of Aeronautics Representative Baltimore, Maryland

Page 3 of 4

CONFIDENTIAL



CONFIDENTIAL

Contract No. NObsr-52503 - Index No. NE 110420

Subject: VA-158 Klystron Oscillator Development Program

DISTRIBUTION LIST

<u>Copy No.</u>	<u>Quantity</u>	<u>Address</u>
32	1	Document Room Project Lincoln (MIT) P.O. Box 390 Cambridge 39, Massachusetts Attn: Ethyl R. Branz
33	1	Bureau of Ordnance Technical Liaison Officer Bell Telephone Laboratories Whippany, New Jersey Attn: Capt. J. G. Franklin
34	1	Hughes Aircraft Company Research and Development Laboratories Culver City, California
35	1	Motorola, Inc. Phoenix Research Laboratory Phoenix, Arizona Attn: Mr. A. S. Hume VIA: Inspector of Naval Material Los Angeles, California
36	1	Bendix Aviation Corporation Pacific Division 166 W. Olive Street Burbank, California Attn: Mr. N. C. Street VIA: Inspector of Naval Material Los Angeles, California
37 - 39	3	Retained for use by Varian Associates

Page 4 of 4

CONFIDENTIAL

Armed Services Technical Information Agency

Because of our limited supply, you are requested to return this copy WHEN IT HAS SERVED YOUR PURPOSE so that it may be made available to other requesters. Your cooperation will be appreciated.

AD 46163

NOTICE: WHEN GOVERNMENT OR OTHER DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE U. S. GOVERNMENT THEREBY INCURS NO RESPONSIBILITY, NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

**Reproduced by
DOCUMENT SERVICE CENTER
KNOTT BUILDING, DAYTON, 2, OHIO**

CONFIDENTIAL