

AD-A171 559

FORCES ON NEUTRAL ATOMS DUE TO ELECTROMAGNETIC FIELDS
(U) MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB
OF ELECTRONICS D E PRITCHARD 04 SEP 86

1/1

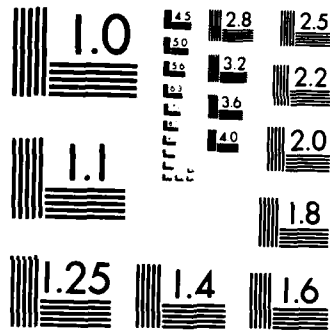
UNCLASSIFIED

N00014-83-K-8695

F/G 7/4

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

ANNUAL SUMMARY REPORT

Forces on Neutral Atoms Due to Electromagnetic Fields

AD-A171 559

Office of Naval Research

Contract N00014-83-K-0695

DTIC
ELECTE
SEP 10 1986
S D

covering the period

1 September 1985 - 31 August 1986

Submitted by:

David E. Pritchard

4 September 1986

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Research Laboratory of Electronics
Cambridge, Massachusetts 02139

DTIC FILE COPY

DISTRIBUTION STATEMENT A
Approved for public release
Distribution Unlimited

86 9 10 041

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified		1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			
4. PERFORMING ORGANIZATION REPORT NUMBER(S)		5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a. NAME OF PERFORMING ORGANIZATION Research Laboratory of Electronics Massachusetts Institute of Technology	6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION	
6c. ADDRESS (City, State and ZIP Code) 77 Massachusetts Avenue Cambridge, MA 02139		7b. ADDRESS (City, State and ZIP Code)	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Office of Naval Research Department of the Navy	8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N00014-83-K-0695	
8c. ADDRESS (City, State and ZIP Code) 800 North Quincy Street Arlington, Virginia 22217		10. SOURCE OF FUNDING NOS.	
11. TITLE (Include Security Classification) Forces on Neutral Atoms Due to Electromagnetic Fields		PROGRAM ELEMENT NO.	PROJECT NO. NR 407-013
12. PERSONAL AUTHOR(S) David E. Pritchard		TASK NO.	WORK UNIT NO.
13a. TYPE OF REPORT Annual Summery	13b. TIME COVERED FROM 9/1/85 TO 8/31/86	14. DATE OF REPORT (Yr., Mo., Day) 4 September 1986	15. PAGE COUNT 2
16. SUPPLEMENTARY NOTATION			
17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB. GR.	
19. ABSTRACT (Continue on reverse if necessary and identify by block number)			
Work by D. E. Pritchard and his collaborators is summarized here.			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> OTIC USERS <input type="checkbox"/>		21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL Kyra M. Hall RLE Contract Reports		22b. TELEPHONE NUMBER (Include Area Code) (617) 253-2569	22c. OFFICE SYMBOL

PROGRESS REPORT

This ONR progress report covers the period 1 September 1985 -
31 August 1986.

A superconducting neutral trap has been constructed and preliminary tests of it have begun. The trap consists of superconducting solenoids to permit slowing and axial confinement and a superconducting octopole magnet for radial confinement in the trap. The trap includes several smaller winding for manipulating trapped atoms. The trap itself is about 40 cm long and has a diameter of 7 cm. It is about 1 Kelvin deep. Na atoms from an atomic beam are to be slowed and then stopped in the center of the trap with counterpropagating laser beams. Initial testing of the magnets, cryogenic vacuum apparatus, and atom source has been completed.

A program to optically trap atoms has been initiated. This is based on the recent discovery of exceptions to the optical Earnshaw theorem. Several possible traps using only spontaneous forces have been suggested and detailed modelling of these traps is underway. An apparatus to trap atoms based on these new ideas is being constructed.

1. D.E. Pritchard, E.L. Raab, V. Bagnato, C.E. Wieman and R.N. Watts, Phys. Rev. Lett. **57**, 310 (1986).



DISTRIBUTION	
Availability Codes	
Dist	Avail and/or Special
A-1	

REPORTS DISTRIBUTION LIST FOR ONR PHYSICS DIVISION OFFICE
UNCLASSIFIED CONTRACTS

Director Defense Advanced Research Projects Agency Attn: Technical Library 1400 Wilson Blvd. Arlington, Virginia 22209	1 copy
Office of Naval Research Physics Division Office (Code 412) 800 North Quincy Street Arlington, Virginia 22217	2 copies
Office of Naval Research Director, Technology (Code 200) 800 North Quincy Street Arlington, Virginia 22217	1 copy
Naval Research Laboratory Department of the Navy Attn: Technical Library Washington, DC 20375	1 copy
Office of the Director of Defense Research and Engineering Information Office Library Branch - The Pentagon Washington, DC 20301	1 copy
U.S. Army Research Office Box 1211 Research Triangle Park North Carolina 27709	2 copies
Defense Technical Information Center Cameron Station Alexandria, Virginia 22314	12 copies
Director, National Bureau of Standards Attn: Technical Library Washington, DC 20234	1 copy
Director U.S. Army Engineering Research and Development Laboratories Attn: Technical Documents Center Fort Belvoir, Virginia 22060	1 copy
ODDR&E Advisory Group on Electron Devices 201 Varick Street New York, New York 10014	1 copy

Copy available to DTIC does not
permit fully legible reproduction

Air Force Office of Scientific Research Department of the Air Force Bolling AFB, DC 22209	1 copy
Air Force Weapons Laboratory Technical Library Kirtland Air Force Base Albuquerque, New Mexico 87117	1 copy
Air Force Avionics Laboratory Air Force Systems Command Technical Library Wright-Patterson Air Force Base Dayton, Ohio 45433	1 copy
Lawrence Livermore Laboratory Attn: Dr. W. F. Krupke University of California P.O. Box 808 Livermore, California 94550	1 copy
Harry Diamond Laboratories Technical Library 2800 Powder Mill Road Adelphi, Maryland 20783	1 copy
Naval Air Development Center Attn: Technical Library Johnsville Warminster, Pennsylvania 18974	1 copy
Naval Weapons Center Technical Library (Code 753) China Lake, California 93555	1 copy
Naval Underwater Systems Center Technical Center New London, Connecticut 06320	1 copy
Commandant of the Marine Corps Scientific Advisor (Code RD-1) Washington, DC 20380	1 copy
Naval Ordnance Station Technical Library Indian Head, Maryland 20640	1 copy
Naval Postgraduate School Technical Library (Code 0212) Monterey, California 93940	1 copy
Naval Missile Center Technical Library (Code 5632.2) Point Mugu, California 93010	1 copy

Copy available to DTIC does not
permit fully legible reproduction

Naval Ordnance Station Technical Library Louisville, Kentucky 40214	1 copy
Commanding Officer Naval Ocean Research & Development Activity Technical Library NSTL Station, Mississippi 39529	1 copy
Naval Explosive Ordnance Disposal Facility Technical Library Indian Head, Maryland 20640	1 copy
Naval Ocean Systems Center Technical Library San Diego, California 92152	1 copy
Naval Surface Weapons Center Technical Library Silver Spring, Maryland 20910	1 copy
Naval Ship Research and Development Center Central Library (Code L42 and L43) Bethesda, Maryland 20084	1 copy
Naval Avionics Facility Technical Library Indianapolis, Indiana 46218	1 copy

Copy available to DTIC does not
permit fully legible reproduction

E N D

10-86

D T / C