

AD-A149 247

HIGH ENERGY PULSED PARTICLE ACCELERATOR(U) MICHIGAN
UNIV ANN ARBOR DEPT OF NUCLEAR ENGINEERING
R M GILGENBACH 31 OCT 84 N00014-83-G-0157

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REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Final Report; "High Energy Pulsed Particle Accelerator"		5. TYPE OF REPORT & PERIOD COVERED Final Aug. 1, 1983 to Oct. 31, 1984
7. AUTHOR(s) R. M. Gilgenbach		6. PERFORMING ORG. REPORT NUMBER
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Accelerator, Long-pulse

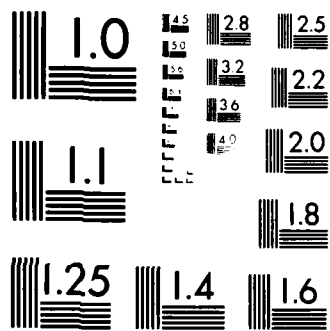
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MICROCOPY RESOLUTION TEST CHART
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This project was performed under the DoD University Instrumentation Program. A state-of-the-art accelerator was designed, constructed, and tested with the following parameters:

Output (working) Voltage: 1 Megavolt;

Pulse length: Adjustable to 1 microsecond from 0.1 microsecond;

Output Energy: At least 10 kJoules in 1 microsecond within voltage flatness;

Current: At least 10 kA into fixed resistance 100 ohm load;

Voltage deviation from flattop: Predicted to be less than $\pm 7\%$ voltage fluctuation into variable diode impedance which decreases from 300 ohms to 50 ohms during the 1 microsecond pulse.

Less than $\pm 5\%$ total voltage deviation into fixed resistance load of 100 ohms.

Unique circuitry was included in the generator to permit electrical compensation for diode impedance droop.

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Office of Naval Research
Final Report/Publications/
Presentations/Honors
for
1 August 1983 through 31 October 1984
for
Contract N 00014 - 83 - G - 0157
"High Energy Pulsed Particle Accelerator"

R. M. Gilgenbach
Nuclear Engineering Dept.
University of Michigan
Ann Arbor, MI 48109

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Acceptance tests: Less than $\pm 5\%$ total voltage deviation into fixed resistance load of 100 ohms

Performed at vendor. Generator tested into 127 ohm fixed impedance to demonstrate peak voltage, voltage deviation from flattop, current/delivered energy, pulse jitter, and voltage falltime. Pulser tested into 200 ohm fixed impedance to demonstrate voltage risetime.

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Unique circuitry was included in the generator to permit electrical compensation for diode impedance droop. Pulse Sciences Inc. performed the accelerator design and constructed the high voltage Marx bank and trigger generators. Control circuits were constructed at The University of Michigan from designs provided by Pulse Sciences. Charging power supplies were procured independently by the University of Michigan. All components were shipped to California for assembly at Pulse Sciences' Laboratory. Resistive load acceptance tests were performed in late June 1984 at Pulse Sciences Inc. The accelerator was then disassembled with the help of a University of Michigan graduate student; this made it possible for the entire machine to be reassembled by U. of M. staff in our particle beam research lab. Full voltage resistive load tests were performed at the University of Michigan in August, again demonstrating flat voltage pulselengths exceeding 1 microsecond.

The month of September was spent designing and fabricating electron beam cathodes, anode beam dump and current monitors. Successful electron beam extraction was demonstrated in mid-October. Preliminary results (presented at the 1984 APS Plasma Physics Meeting) demonstrated flat voltage during a ramping current pulse. These initial data were consistent with a diode plasma closure velocity of 2.5 cm/microsecond.

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Faculty/Graduate Students with Research
Related to this Accelerator

Faculty:

R. M. Gilgenbach, Assoc. Prof.
W. D. Getty, Prof.
M. L. Brake, Asst. Prof.
T. Kammash, Prof.
R. S. Ong, Prof.
J. J. Duderstadt, Prof. and Dean

Graduate Students

Tucker, John
Cheung, Patrick
Horton, Lorne
Lucey, Robert
Cuneo, Michael
Miller, Joel
Meachum, Joseph
Bidwell, Steven
Smutek, Louis
Les, John
Thornhill, Ward
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Papers Presented at Scientific Conferences

"Microsecond Electron Beam Interactions with Monatomic and Diatomic Gases," R. M. Gilgenbach, L. D. Horton, M. L. Brake, R. F. Lucey, and J. E. Tucker. Presented at the 26th Annual Meeting of the Division of Plasma Physics of the American Physical Society, October 29, 1984, Boston, MA.

Bulletin of the American Physical Society, 29, 1197 (1984).

Honors and Awards, R. M. Gilgenbach

National:

- 1) Presidential Young Investigator (1984-1989)
- 2) Centennial Key to the Future Award (1984)
from the IEEE Nuclear and Plasma Sciences
Society

Patents

None

Refereed Journals and Books

None for this accelerator as of October 1984

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