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FINAL REPORT

TITLE

RETROFUGAL FLUX OF ELECTRONS

FROM A

MONOENERGETIC BEAM DIRECTED AT A THICK TARGET

New Mexico State University
Department of Physics

1 December 1964 to 31 January 1966

ARO-D Project No. 4678-P
Grant No. DA-ARO-31-124-G626

Dr. Ralph Dressel

Prepared at Research Center
New Mexico State University
University Park, New Mexico

September 1966

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Dr. Ralph Dressel
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July 1966

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PROBLEM:

The problem studied under this grant concerns the magnitude, the angular distribution, and the energy spectra of those electrons returning from a plane interface irradiated by a collimated beam of monoenergetic electrons.

RESULTS AND CONCLUSIONS:

Nearly monoenergetic electrons in a collimated beam have been directed at normal incidence onto a variety of thick targets ranging in atomic number from $Z=4$ for beryllium to $Z=92$ for uranium. The ratio $r(\theta, E_0, Z)$ of the number of retrofugal electrons (backscattered primaries plus energetic secondaries) per steradian to the number of incident primaries has been measured for a total of 11 targets. The mean energy E_0 of the incident electrons was varied from 0.5 to 10 MeV and the dependence of r upon θ explored for angles between 90° and 180° . For targets having $Z > 29$ the angular distributions are independent of E_0 and are described by $\cos^{1.35\theta}$; but targets with $Z \leq 13$, $r(\theta, E_0, Z)$ depends upon all three parameters. Typical values obtained for the retrofugal flux coefficient range from 1.2 milliunits/steradian for Be to 274 milliunits/steradian for U. Energy spectra of the retrofugal electrons appearing at 155 degrees have also been measured over an interval from 0.16 MeV to the incident energy E_0 . Each spectrum profile has a broad but well defined maximum which progressively shifts toward higher energy as E_0 is increased but which eventually reaches an upper limit determined by the target atomic number Z .

PUBLICATIONS AND TECHNICAL REPORTS:

Papers presented at Scientific Meetings

New Mexico Academy of Science, Albuquerque, 25 October 1963.

American Physical Society, Washington, D.C., April 1964.

Army Research Conference, West Point, New York, June 1964.

American Association for the Advancement of Science,
New Mexico State University, May 1966.

Journal Articles

"Retrofugal Electron Flux from Massive Targets Irradiated with
a Monoenergetic Beam", Phys. Rev, 144 332 (1966).

"Energy Spectra of the Retrofugal Electron Flux from Massive
Targets", Phys. Rev, 144 344 (1966).

SCIENTIFIC PERSONNEL:

Principal Investigator: Ralph Dressel

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