Title
SUMMARY OF THE RESEARCH PROGRESS MEETING OF AUG. 23, 1951.

Author
Shewchuck, Sergey.

Publication Date
1951-09-17

UCRL-1481
Unclassified-Physics Distribution

UNIVERSITY OF CALIFORNIA

Radiation Laboratory

Contract No. W-7405-eng-48

SUMMARY OF THE RESEARCH PROGRESS MEETING OF AUGUST 23, 1951

Sergey Shewchuck

September 17, 1951

Berkeley, California

SUMMARY OF THE RESEARCH PROGRESS MEETING OF AUGUST 23, 1951

Sergey Shewchuck

Radiation Laboratory, Department of Physics
University of California, Berkeley, California

September 17, 1951

Isotopes in the Region of 82 Neutrons - R. W. Hoff

Up until a few years ago the only alpha activity known was in the region of the heavy elements. Recently alpha emitters were found in the rare earths' region; namely, Sm, Gd, Eu and Tb. These alpha emitters are in the range of 82 to 86 neutrons. The highest energy of the alpha emitters is from the 84 neutron isotope. Its daughter of 82 neutrons appears to be a closed shell and of a particularly stable configuration.

Studies of the bata decay properties of Eu isotopes were made in the low neutron range. Sm isotopes were bombarded at the 60" cyclotron and linear accelerator. Isotopes were obtained up to 70 percent pure after separation processes by ion exchange and chemical reduction techniques. Some bombardments didn't require separation as only one isotope would be formed; e.g. $Sm^{144}(p,n)Eu^{144}$. All the isotopes of Eu from Eu^{144} through Eu^{150} were formed.

An extract of the isotope chart in the region of 82 neutrons is reproduced, Fig. 1. Eu^{151} and Eu^{153} are stable. The half-life of Eu^{149} was determined by several experiments to be about 120 days. Hence, a possible curve for the trend of the half lives of Eu isotopes in the direction of the lower neutron number from Eu^{149} shows no perceptible straightening. Instead, a sharp discontinuity is noted between Eu^{145} and Eu^{144}. This discontinuity is attributed to the closed shell of the

82 neutron configuration and its consequent rise in neutron binding energy.

Fig. 2.

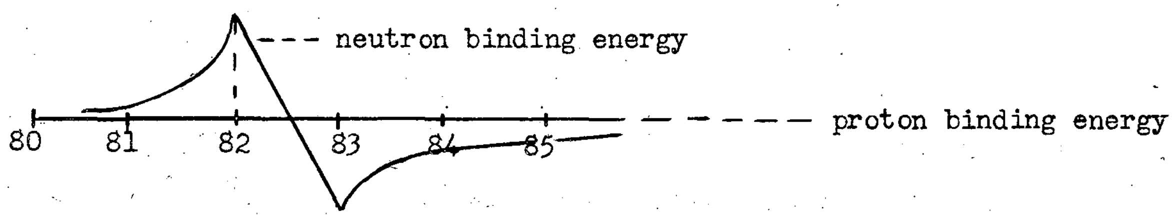

Fig. 2. A possible postulated curve for the neutron binding energy in the region of 82 neutrons.

Elastic D-P Scattering - Martin O. Stern

The details incorporated in Dr. Stern's talk are found in the following reports:

UCRL-1440 Experiments on Elastic Scattering of 190 Mev Deuterons by Protons, Martin O. Stern (Thesis), August 1951.

UCRL-1442 Experiments on Scattering of 190 Mev Deuterons by Protons, Arnold L. Bloom (Thesis), August 15, 1951.

UCRL-1250 Summary of the Research Progress Meeting of April 19, 1951, II. D-P Scattering, Martin Stern.

The summary of report UCRL-1440, mentioned above, is as follows:

"The elastic differential scattering cross section of 190-Mev deuterons by protons has been measured from 15° to 170° in the center of mass system. The cross sections were obtained by subtracting the carbon counts from those received with a polyethylene target. A scintillation coincidence counting technique was used over most of the range of angles measured."

The abstract from report UCRL-1442, also mentioned above, is as follows:

"The total cross section for scattering of 190 Mev deuterons on protons and the differential cross section for certain types of inelastic deuteron-proton scattering, were measured in the external deuteron beam of the Berkeley synchrocyclotron. The total cross section was determined by measuring the differential cross section for scattering of charged particles from a hydrogen target; since any such collision, elastic or inelastic, will scatter two charged particles the integral of this cross section over all solid angles gives twice the total cross section desired. The cross section obtained in this way is $92 \pm 7 \times 10^{-27}$ cm^2, with Rutherford scattering excluded. Cross sections for inelastic scattering in which both protons suffer large changes of momentum have been examined by measuring coincidences between scattered protons; it is found that the protons are scattered nearly 90° apart in the laboratory system, with a narrow distribution in angle owing to the internal momentum of the deuteron. Comparison of the experimental results is made with theory."

Information Division
10/1/51 bm

SECTION OF ISOTOPE CHART

ATOMIC No.	81	82	83	84	85	86	87	88	89	90
66				e Dy 7 M α 4.21	e Dy 19M α 4.06	e Dy 2.3H α 3.61				Dy^{156} 0.052
65				a Tb^{149} 4.1H α 3.95		c Tb^{151}_{150} 19 H α 3.44				
64				b Gd^{148} long α 3.16	c Gd^{149} 9D K e^-.35 α 3.0(?)	e Gd^{150} long α 2.7		Gd^{152} 0.20		Gd^{154} 2.15
63	e Eu^{144} 18 M β^+ 2.5	c Eu^{145} 5D K,e^- 02	e Eu^{146} 1.5D K,e^-0.4	b Eu^{147} 24D K,e^-0.2 α 2.88	b Eu^{148} 50 D K,e^-.038 γ .6	Eu^{149} >50D	c Eu^{150} 15H β^+, e^-	Eu^{151} 47.8		Eu^{153} 52.2
62		Sm^{144} 3.1			Sm^{147} 15.0 ~1.35×10^{11}Y α 2.18	Sm^{148} 11.2	Sm^{149} 13.9	Sm^{150} 7.4		Sm^{152} 26.8

NEUTRON No.

MU 2267

Fig. 2