

MASTER

PROGRESS REPORT

Recoil properties of ^7Be produced in the interaction of 1- to 11.5-Gev protons with ^{27}Al

This work completes the recoil study of radioactive products from the proton bombardment of aluminum by the "thick-target thick-catcher" technique.^{1,2} The recoil properties of ^{22}Na and ^{24}Na were measured with proton energies from 3 Gev to 300 Gev.¹ Similar measurements were reported for the products ^{11}C and ^{18}F at 1, 3, 6, and 11.5 Gev.²

Because ^7Be is formed directly in nearly all catcher materials by high-energy protons, the "difference" method, described in reference 2 was used here. This method consists of exposing a stack of 3 or more aluminum foils to a beam of particles inside a large vacuum region. The smaller activity of the end foils, compared to that of the middle foils, is a measure of the recoil properties of the product.

The experimental results for the products ^7Be , ^{11}C , ^{18}F , ^{22}Na , and ^{24}Na are given in the following table. The earlier results of Poskanzer, Cumming, and Wolfgang at other energies³ are included.

The symbols in the table are W = thickness of target; B and F = fraction of product atoms that recoiled into the backward and forward catcher foils respectively; T = fraction remaining in the target foil; F/B = a measure of the forward momentum imparted by the incident proton; and $2W(F+B)$ = a measure of the average range of ^{the} product nucleus. A more complete analysis of these results, based on the procedure described in reference 4, will be included when the results given in the table are presented for publication.

The values of K and N for the range-energy relation, $R = KE^{N/2}$, are also included.⁵

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References

1. E. P. Steinberg and L. Winsberg, Phys. Rev. C 10, 1925 (1974)
2. Report No. 5 under ERDA Contract No. EY-76-S-02-2324.*000 (1976)
3. Poskanzer, Cumming, and Wolfgang, Phys. Rev. 129, 374 (1963)
4. Report No. 7 under ERDA Contract No. EY-76-S-02-2324.*000 (1977)
5. L. C. Northcliffe and R. F. Schilling, Nucl. Data A7, 233 (1970)

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$p + \overset{27}{A.L} \rightarrow$

STATION DEPTH (GLV)	# OF MEASURE	W (mg/l/cm ²)	B	T	F	F/B	2W(F/B) mg/l/cm ²
⁷Be $K = .416, N = 1.924$							
1	2	2.394	.117	.551	.332	2.84	2.15
3	2	2.260	.131	.580	.289	2.21	1.90
6	2	2.515	.131	.565	.304	2.32	2.19
11.5	2	2.631	.140	.552	.308	2.20	2.40
¹²C $K = .323, N = 1.688$							
1	1	1.887	.111	.575	.314	2.83	1.60
3	3	1.804	.116	.582	.302	2.60	1.51
6	3	1.825	.121	.569	.310	2.56	1.57
11.5	3	1.828	.112	.605	.283	2.53	1.44
¹⁸F $K = .325, N = 1.356$							
1	1	1.837	.0676	.7257	.2067	3.06	1.04
3	3	1.804	.0666	.7395	.1939	2.91	.94
6	3	1.825	.0777	.7264	.1959	2.52	1.00
11.5	3	1.828	.0654	.7503	.1838	2.81	.91
²²Na $K = .320, N = 1.282$							
3	2	1.78	.0478	.8177	.1345	2.81	.649
6	6	1.864	.0458	.8273	.1269	2.77	.644
9	3	1.84	.0473	.8251	.1276	2.70	.644
11.5	3	1.84	.0481	.8264	.1255	2.61	.639
200	1	1.80	.0583	.8254	.1163	2.00	.629
300	2	1.88	.0500	.8333	.1167	2.33	.627

REFERENCE
THIS WORK

ERDA REPORT
NO. 5
(Ref. 2)

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(Ref. 2)

Phys. Rev C 10, 1925 (1974)
(Ref. 1)

