D6 Discussion on the ^{7}Li(n, α t)n Reaction

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D7 Experimental Evidence for (n, α) Knock-out Reactions on Nuclei in Mass Number Region A = 100

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D8 On the Widths of Some ^{9}Be and ^{6}Li Energy Levels

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The reactions ^{7}Li(^{3}He, p)^{9}Be and ^{7}Li(^{3}He, ^{4}He)^{6}Li have been used[1–5] to obtain the widths of a number of low-lying energy levels in ^{9}Be and ^{6}Li. Some of these widths have also been investigated[3] by means of ^{9}Be(γ, n)^{8}Be and ^{4}He(d, d)^{4}He. Table I, columns 2, 3 and 4 show the level widths obtained in the papers referred to above,

^{9}Be energy levels (MeV)	LEVEL WIDTH (KeV)				Expl. peak width (KeV, LS)
	ref. 1	ref. 2	ref. 3	this work (CMS)	
1.67			200± 20	122±12	106±11
2.43	⩽35	<8	1.0±0.2	⩽2	76±3
3.03	274±15	289± 22	265±17	145± 38	156±35
4.70	600⩽Γ⩽1000	743± 55	730±150	364±58	338±52
6.66	1700⩽Γ⩽2200		1300±120	455±72	412± 70
^{6}Li energy levels (MeV)					
2.18	⩽100	⩽40	⩽30 (35±5)	⩽40	121±17
3.56	⩽100	⩽40	⩽30	⩽40	121±17

The present data on the widths of the same levels in ^{9}Be and ^{6}Li in some cases differ considerably from those given by other authors.

This experiment was carried out with a (1100 ± 2) keV ^{3}He beam bombarding a 50 μg/cm^2 LiF target (evaporated on Ni foil). The emerging particles were detected at $\theta_{lab} = 110°$ with a 2 mm thick Si counter with a 1.8 mg/cm^2 Al foil placed in front of it.

Fig. 1 shows a typical spectrum, with the isolated peaks corresponding to proton, deuteron and α-particle groups indicated. The widths of corresponding levels are given in the Table I, column 5. These were obtained after substracting the experimental peak width of the p_0 group from the other proton widths, and of the α_0 group from the other α-particle peaks, with the usual least square procedure. To point out the differences between the present and all previous data, the experimental widths of corresponding peaks are presented in column 6 of Table I.

The widths of the ^{9}Be levels investigated are 2—3 times smaller than those given by other authors.

References

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3) F. Ajzenberg-Selove and T. Lauritsen, Nucl. Phys. **78** (1966) 1;
4) K. W. Allen, E. Alinqvist and C. B. Bigham, Proc. Phys. Soc. **75** (1960) 913;
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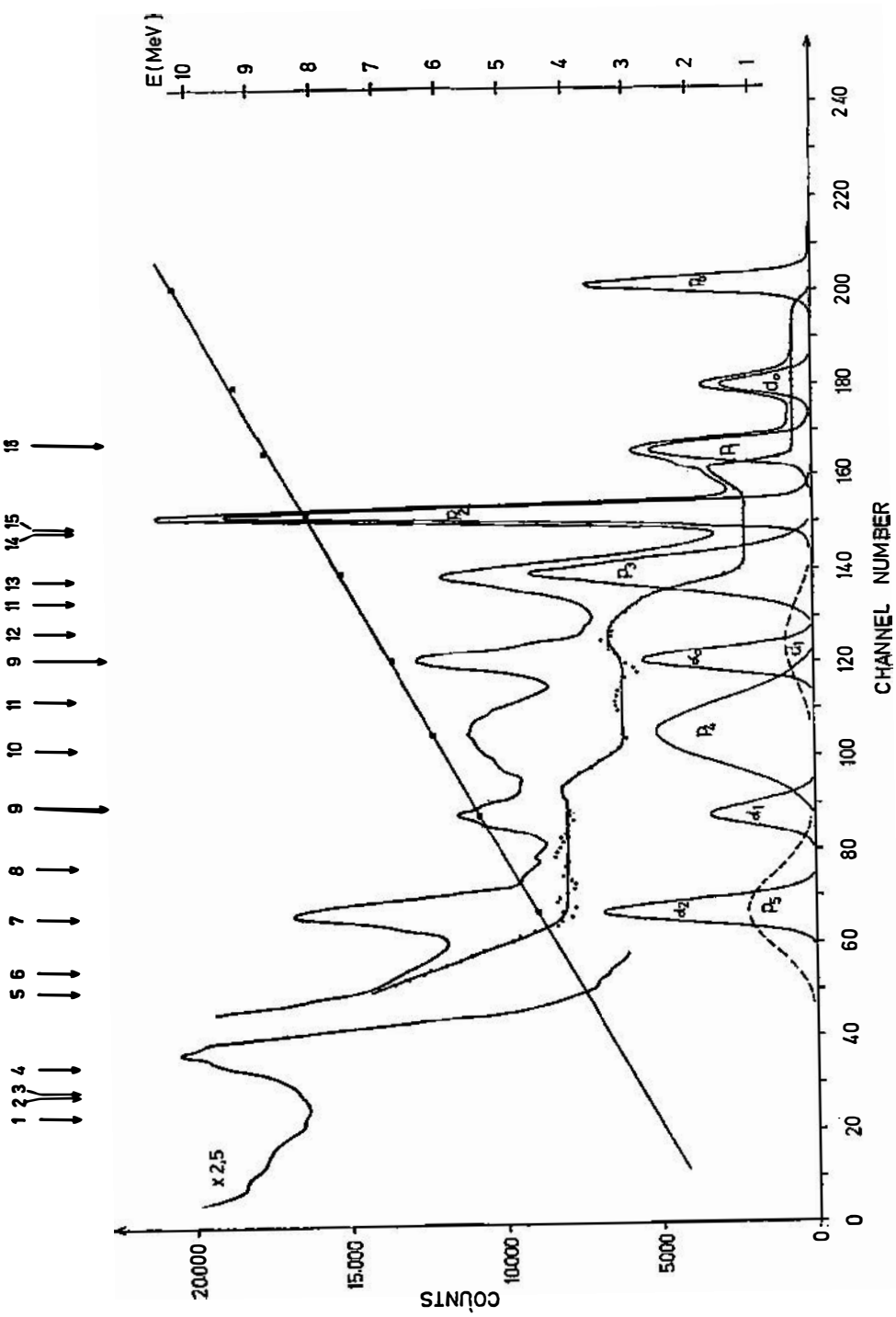
Fig. 1. The particle spectrum obtained by bombarding a LiF target with ^{3}He. Arrows indicate the energies of the particle groups from different reactions on ^{16}O, ^{12}C, ^{6}Li, as well as from the three-body break-up reactions:

1) $^{16}O(^3He, p)^{18}F$
2) $^{16}O(^3He, \alpha)^{15}O$
3) $^{12}C(^3He, p_1)^{14}N$
4) $^7Li(^3He, \alpha n)^5Li$
5) $^7Li(^3He, \alpha p)^5He$
6) $^6Li(^3He, \alpha_1)^5Li$
7) $^7Li(^3He, \alpha d)^4He$
8) $^{12}C(^3He, p_0)^{14}N$
9) $^7Li(^3He, pn)^8Be^*_{2,90}$
10) $^6Li(^3He, pn)^7Be$.
11) $^6Li(^3He, \alpha_0)^5Li$
12) $^6Li(^3He, p)^4He$
13) $^7Li(^3He, d\alpha)^4He$
14) $^6Li(^3He, p_2)^8Be$
15) $^7Li(^3He, p\alpha)^5He$
16) $^7Li(^3He, pn)^8Be$

The steps on the continuous spectra may be attributed to three body break-up reactions indicated by longer arrows. Pairs of arrows for the reactions (9) and (11) indicate the widths of the final nucleus states.


E (MeV)
10
9
8
7
6
5
4
3
2
1
1 2 3 4 5 6 7 8 9 10 11 9 12 11 13 14 15 15 16
x 2,5
20000
15.000
10000
5000
0
COUNTS
0
20
40
60
80
100
120
140
160
180
200
220
240
CHANNEL NUMBER
P0
P1
P2
P3
P4
P5
d0
d1
d2
d3
d4