Deuteron emission in the β-decay of ^{11}Li and ^{6}He

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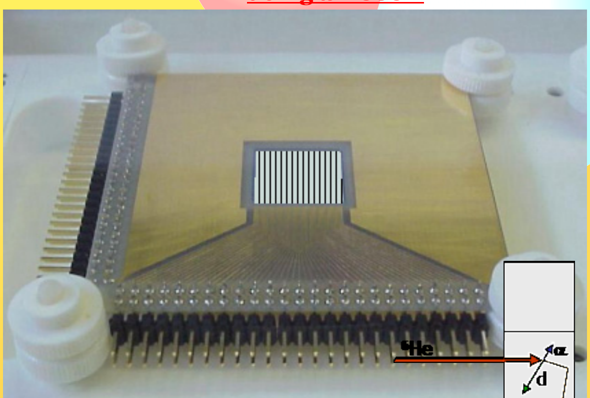
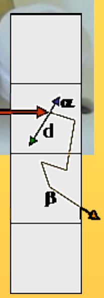
Implantation Technique using a DSSSD

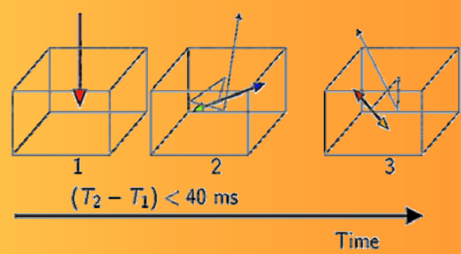


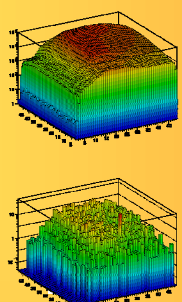


Doubled Sided Silicon Strip Detector
48x48 strips, 300μm width, 16x16mm², 78μm thick

- energy of implanted ion very well known
- detection efficiency of decay events ≈ 100%
- very precise normalisation of the various decay channels
- calorimetric detection of charged particles
- strong suppression of the β-background

Time and position correlation

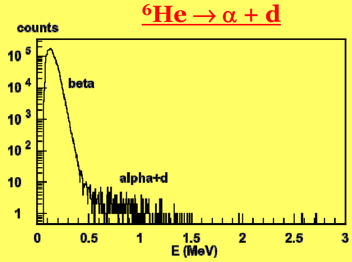


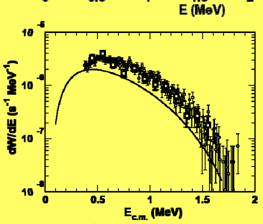


The emitted ions and the daughter nuclei remain **confined** to the same pixel where the mother nucleus was implanted. Time correlations can be made acquiring a time stamp for each event.
The identification of different decay channels is based on the **spectrum of the emitted particles**, **timing behaviour** of the radiation, and on **correlations** between the implantation signal, the **decay signature**, and possible further signals from **daughter-decay** (2nd decay).

This technique was used to identify the channels **^{11}Li → ^{9}Li+d** and **^{11}Li → ^{8}Li+t** and to extract absolute branching ratios.

^{6}He → α + d





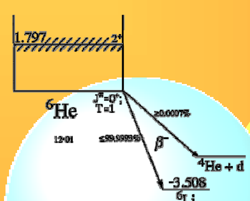
The **branching ratio of the very weak β-delayed α+d channel in the decay of ^{6}He** was measured with a **precision of ~7% :**

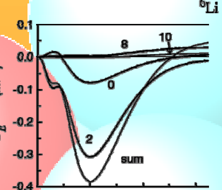
BR=1.62(11) x 10⁻⁶ above 525keV E$_{c.m.}$ (black boxes)

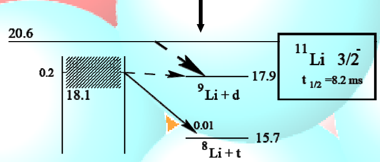
The result is compared with an earlier experimental result (circles,[1]) and a theoretical calculation (solid line,[2]).

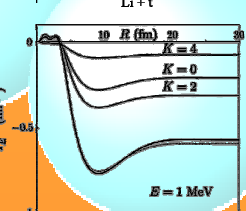
[1] *D. Anthony et al., Phys. Rev. C* ***65***, *034310 (2002)*

[2] *E.M. Tursunov, D. Baye, and P. Descouvemont, Phys. Rev. C* ***73***, *014303 (2006)*

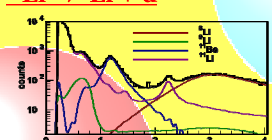


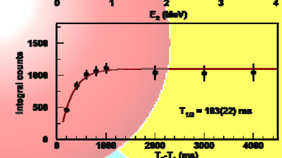


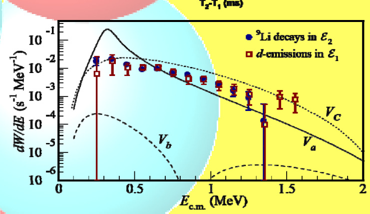




^{11}Li → ^{9}Li + d







By applying the **time and position correlations**, the branching ratio of the deuteron emission channel was measured : **BR = 1.30(13) x 10⁻⁴ above 200keV E$_{c.m.}$**
Such a "large" value is only possible if the core does not contribute → **decay in the halo**
By comparing the experimental result with theoretical calculations using different ^{9}Li+d potentials [3,4], one can conclude that the **decay proceeds mainly to the continuum**

[3] *V_a,V_b : D. Baye et al., PRC 74 (2006) 064302*

[4] *V_c : M. Zukhov et al., PRC 52 (1995) 2461*

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