**Electron capture of $^8$B into the highly excited states of $^8$Be**

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8B is very important in astrophysics as it is the only source of solar neutrinos above 2 MeV. Predominantly, it is $^8$B decay followed by the fragmentation into 2p particles through 3.03 MeV state and, less probably, through the 11.4 MeV state. These states are broad and produce a continuous spectrum as seen in the left figure.

The decay of this nucleus is further interesting in nuclear structure because $^8$B is the only confirmed proton halo nucleus in the ground state [1]. Our interest lies in determining the branching ratios and the properties of the 2+ doublet at 16.6 and 16.9 MeV populated via electron capture (EC) and $^8$B. This doublet has high isospin mixing [2]. Also, we want to detect the so far unobserved EC delayed proton emission via the 17.640 MeV state, which has a theoretical branching ratio of 2.3×10−6 [3].

**Experimental set-up**

We used a set of 4 particle-telescopes formed by 1 double sided silicon stripped detector (DSSD) plus 1 thicker Si-detector. Also, another DSSD on the bottom to maximize the B detection.

The center of this setup is the catcher of carbon foil of 31μg/cm² where is implanted the $^8$B beam. This is surrounded by the particle-telescopes to optimize the detection. They are put face to face with the same thickness to detect the α-α coincidences at 180°.

The thickness of the detectors has been fixed to stop all the α-particles of the $^8$Be fragmentation (64μm) and to have good resolution at low energies (40μm).

**Data analysis and preliminary results**

Searching for the proton - Cleaning the low energy part of the spectrum

When the 17.6 MeV state is populated by EC, a 333keV proton in coincidence with a non-detectable X-ray is emitted and remains a 3 Li nucleus.

Due to the extremely low branching ratio (2.3×10−6) of the emission of the proton, we have to clean the low energy part of all possible contaminants.

As the main activity is $8$Be(αα) (multiplicity 3), by choosing multiplicity 1, i.e., hit in only 1 of the detectors, a reduction of a factor of 1000 in the low energy part is obtained.

**Summary and outlook**

1. The 2+ doublet: after having analyzed 2% of the data it points to that we will determine the 16.9 MeV state within a 4% statistical error.

2. The 17.6 MeV state and the proton: the low energy part of the spectrum can be cleaned enough in order to detect a 10^6 event branching. This part of the experiment will take place in spring.

3. Further, as bonus the statistic will allow for an improvement on the half-life determination of the $^8$B. Present accepted value is (770 ± 3) ms [5].

**References**


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