Atti Accademia Nazionale dei Lincei

Classe Scienze Fisiche Matematiche Naturali

Rendiconti

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The (e,e'p) Reaction in the ^{75}As Nucleus

Atti della Accademia Nazionale dei Lincei. Classe di Scienze Fisiche, Matematiche e Naturali. Rendiconti, Serie 8, Vol. **41** (1966), n.6, p. 494–496.

Accademia Nazionale dei Lincei

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Fisica nucleare. — *The* $(e, e' p)$ *Reaction in the* ^{75}As *Nucleus* (*). Nota di UGO AMALDI Jr. (**), GLORIA CAMPOS VENUTI (**), GIORGIO CORTELLESSA (**), ENZO DE SANCTIS (**), SALVATORE FRULLANI (**), ROSELYNE LOMBARD (**) e PAOLO SALVADORI (**), presentata (***) dal Corrisp. M. AGENO.

RIASSUNTO. — Con l'apparato sperimentale già utilizzato per lo ^{32}S e per il ^{40}Ca, sono state studiate le energie mancanti dei protoni nello ^{75}As mediante la reazione $(e, e' p)$.

Sono riportati i risultati ottenuti, interpretati, come nei casi precedenti, interpolando i dati sperimentali con una somma di funzioni di tipo maxwelliano. Si traggono alcune conclusioni sui problemi teorici e sperimentali che vanno studiati, e sulla necessità di una sperimentazione con un apparato che permetta una maggiore velocità di conteggio e misure di distribuzioni angolari, soprattutto per il sovrapporsi, evidente nei dati sperimentali, dei processi tipo $(e, e' p)$ corrispondenti ad alte energie mancanti con altri processi anelastici, presumibilmente elettroproduzione di mesoni π.

In a previous paper [1] presenting the results of a measurement of the $(e, e' p)$ reaction in ^{32}S, we have anticipated an extension of the search for the study of inner proton levels to heavier nuclei. The chief argument is that $(p, 2p)$ reactions that could, in principle, give the same information are strongly handicapped by absorption and distorsions within the nucleus. Moreover recent calculations [2] based on the use of an effective nucleon-nucleon interaction predict a monotonic increase of the single particle energy of the $1s$ protons with A for $A > 40$, continuing the behaviour which for $A < 40$ has been suggested by our previous study of the $(e, e' p)$ reaction in ^{27}Al [3], ^{32}S [1] and ^{40}Ca [4].

The experimental apparatus is identical to that used for the ^{32}S and ^{40}Ca measurements. The measured spectrum is shown in Fig. 1 versus both the incoming electron energy E_0 and the missing energy $E_M = E_0 - E - T$.

Two main contributions to the spectrum centered around $E_M \sim 30$ MeV and $E_M \sim 110$ MeV are apparent. Since between them a third contribution should not be excluded, with the program previously used we have fitted to the measured points the sum of three maxwellian curves plus a « background » straight line. The confidence level of the best fit is 25%. The curves are drawn in Fig. 1 and their parameters are collected in Table I together with the statistical errors. (E_M and σ are the center and the width of a maxwellian curve).

(*) This work is a part of a research program within the framework of the activity of the « Sottosezione Sanità » of the Istituto Nazionale di Fisica Nucleare.

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(***) Nella seduta del 10 dicembre 1966.

TABLE I.

	A	B	C
E_M (MeV)	27 ± 8	58 ± 14	111 ± 12
σ (MeV)	28 ± 12	32 ± 25	52 ± 20

A naïve approach to the treatment of these data could be to extrapolate the interpretation of (*p* , 2 *p*) data and of our previous results (*e* , *e'* *p*) [5] and attribute the contributions C, B and A to the protons extracted from 1 *s*, 1 *p* and outer shells respectively. However this interpretation cannot be substantiated before a careful analysis of various theoretical and experimental problems is made. For instance the effect of multiple processes in such a heavy nucleus must be clarified while, from the experimental point of view,

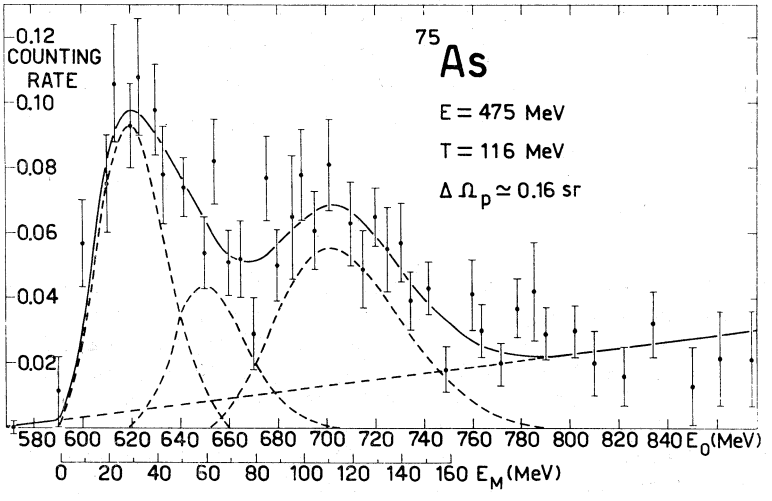

Fig. 1.

the contamination of electroproduction events has to be subtracted. In fact in Calcium measurement we obtained a zero counting rate for E_M bigger that the contribution attributed to the 1 *s* shell. For ^{75}As unfortunately the tail of bump C is in the region where electroproduction processes are energetically possible.

The main point we like to make in this paper is that to pursue this experimentation to higher mass numbers a different apparatus is needed. For instance careful angular distributions could help in separating electroproduction processes. This should be obtained together with an increase in counting rate. In fact the spectrum of Fig. 1 has been collected in 150 hours of run-

ning time, which sets a practical limit to the use of the present apparatus. A new apparatus is planned to be used for future experiments.

A second purely experimental point is that in the spectrum of Fig. 1 we have been compelled to subtract few counts to the points between 590 and 600 MeV machine energy because of a hydrogen contamination into the target. With a separate measurement in the same geometric condition, using a CH_2 target, we have been able to demonstrate that two of our electron channels may " see " the hydrogen contamination and the two other not, as it is also possible to infer from kinematic relations. We have discarded the contribution of the most contaminated channel that counts essentially all hydrogen, being below the threshold for counting the ^{75}As contribution, and we have used the information from this channel to correct for the other less contaminated channel, using the relative counting rate determined with a CH_2 target. The correction is applied to one point out of the 42 experimental points and is 30% of this point, affected already by a 20% statistical error, due to the very low counting rate.

We thank Dr. G. Farchi for performing the interpolation of the spectra. We have pleasure in thanking the Frascati Machine Staff for their help in the non trivial task of keeping all parameters of the beam within very close limits. We also thank our two technicians, Mr. M. Grignoli and Mr. G. Piccinelli especially for taking care of the electronics of the experiment.

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