Base #1

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ENERGY LEVELS OF Pt^{197}

by

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R E S U M O

Espectros de raios γ (maiores que 0.3 MeV) oriundos da desintegração β^- do Ir^{197} foram medidos com um detetor de Ge-Li (30 cm^3). A alimentação dos níveis 877.6 ± 0.3; 939.7 ± 0.3; 1049.6 ± 0.3; 1341.8 ± 0.3 KeV de Pt^{197} por desintegração β^- do Ir^{197} foi proposta e os limites inferiores para o log ft determinados.

Spin e paridade $(1/2, 3/2)^+$ foram atribuidos ao estado fundamental do Ir^{197}.

Uma nova transição de 299.5 ± 0.2 KeV, seguindo a desintegração β da Pt^{197} (80 min), foi observada.

ABSTRACT

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Spectra of γ rays (higher than 0.3 MeV) following the β decay of Ir^{197} are measured with a Ge-Li detector ($30cm^3$). The existence of four new branches to the Pt^{197} levels at 877.6 ± 0.3; 939.7 ± 0.3; 1049.6 ± 0.3; 1341.8 ± 0.3 KeV is proposed and lower limit log ft values determined. Spin and parity $(1/2, 3/2)^+$ are assigned to the ground state of Ir^{197}.

A new transition of 299.5 ± 0.2 KeV was observed following the Pt^{197} (80 min) decay.

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INTRODUCTION

The Pt^{197} nucleus is situated in a transitional region. So, changes between spherical and deformed shapes can be expected to happen. A good understanding of the nuclear structure of this nuclei, up till now unachieved, is very interesting and previous experimental information concerning nuclear reactions and decay experiments, have been rather sparse. They are summarized in the compilation[1].

The present study was undertaken with the hope to obtain data on Pt^{197} nuclear levels, which could help the development of a more satisfactory theory of "nearly spherical" even odd nuclei.

EXPERIMENTAL TECHNIQUE

Natural Platinun was irradiated in the Bremsstahlung beam of a linear accelerator at 28 MeV producing Ir^{197} by (γ,p) reactions. States in Pt^{197} were accessible from the decay or Ir^{197} whose desintegration energy is 2 MeV[2]. The main disavantage of this method is that below 300 KeV, it becomes very difficult to distinguish γ rays, corresponding to transitions in Pt^{197}. There is in this region a strong contribution of other nuclei also formed.

A special search was then performed for weak

spectrum lines above 300 KeV and a 3mm Pb and Cu absorbers were introduced aiming to decrease the strong low energy background. Measurements of gamma-ray spectra were carried out and energies, intensities, and half-lifes determined.

RESULTS

Fig. I illustrates one of the gamma-ray spectrum from Ir^{197} decay. Four weak spectrum lines unrecorded previously and with half-lives in strict similarity to that of the Ir^{197} ground state are founded. In several runs performed in order to check our results, the new gamma-rays values were systematically consistent. Lower limit log ft values could be estimated from our results and from β spectroscopy data [4].

Table I, lists energies, intensities, and the lower limit log ft values for the proposed β branches. The resulting spins and parities assignments are in complete agreement with nuclear reactions data [4,5] if the ground state spin of Ir^{197} are assumed to be $1/2^+$ or $3/2^+$.

In Table II we summarize the experimental information available, concerning to Pt^{197} energy levels and observed in $(d,p)^4$, $(d,t)^4$ and $(n,\gamma)^5$ experiments. As a whole, the setting levels is in good agreement with these results.

With respect to transitions following the Pt^{197} (80 min) decay also analysed in the present work, a new transitions of 299.5 ± 0.2 KeV was observed. It can be

interpreted as arising from the level 280 ± 20 KeV detected by Mukherjee[4].

DISCUSSION

All the gamma-rays observed in our measurements are positionned in a tentative decay scheme showed in comparison with previous results [6] in fig. II.

The ground state spin proposed according to our log ft values is in conformity to results of all other measured nuclei with Z = 77(Ir^{191}, Ir^{193})(7) and Z = 79 (Au^{197},Au^{199})(6)(7).

The agreement between our results and the theoretical description of Kisslinger and Sorensen [8] is very poor.

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ENERGY (KeV)	RELATIVE INTENSITY	LOG ft
511,0 ± 0,2	100	6,7
877,6 ± 0,2	0,8 ± 0,1	7,1
938,7 ± 0,3	0,9 ± 0,1	7,1
1049,6 ± 0,3	0,51 ± 0,05	7,2
1341,8 ± 0,3	0,45 ± 0,05	5,6

TABLE I

Gamma transitions following the β decay of Ir^{197}

OUR WORK $Ir^{197}\beta^- \rightarrow Pt^{197}$	MUKERJEE[4]		SAMOUR[5] $Pt^{196}(n,\gamma)Pt^{197}$
	$Pt^{196}(d,p)\ Pt^{197}$	$Pt^{198}(d,t)\ Pt^{197}$	
877,6 ± 0,3	880 ± 20	880 ± 20	--------
938,7 ± 0,3	--------	--------	965 ± 30
1049,6 ± 0,3	1070 ± 20	1050 ± 20	1076 ± 30
1341,8 ± 0,3	--------	1320 ± 20	--------

TABLE II

Energy levels of Pt^{197}

OUR WORK		HAVERFIELD AT AL[6]	
ENERGY (KeV)	RELATIVE INTENSITY	ENERGY (KeV)	RELATIVE INTENSITY
346,5 ± 0,2	100	346	100
279,1 ± 0,2	21 ± 2	279	21 ± 2
299,5 ± 0,2	0,9 ± 0,1	---	------

TABLE III

Gamma transitions following the decay of Pt^{197m}

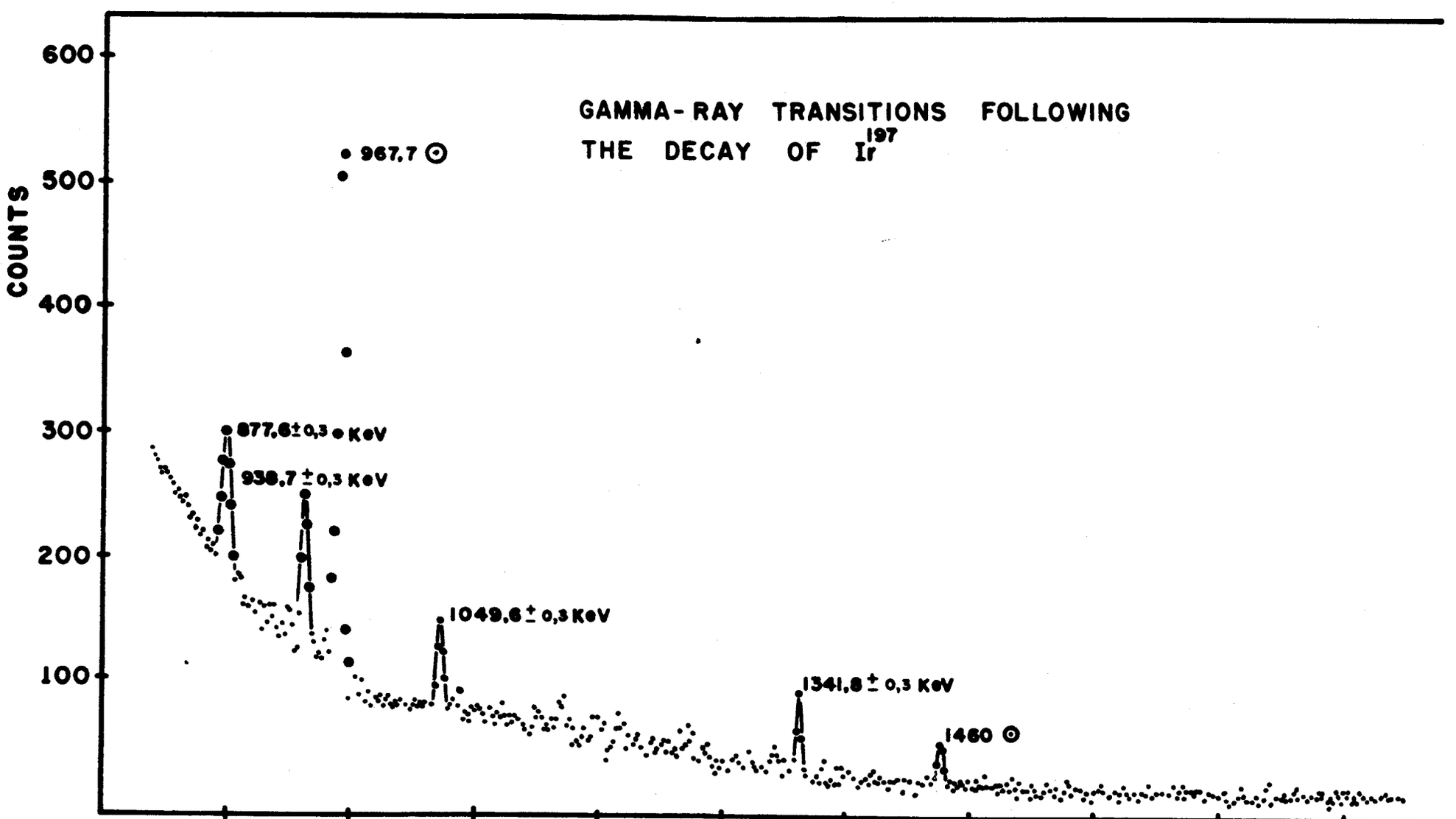
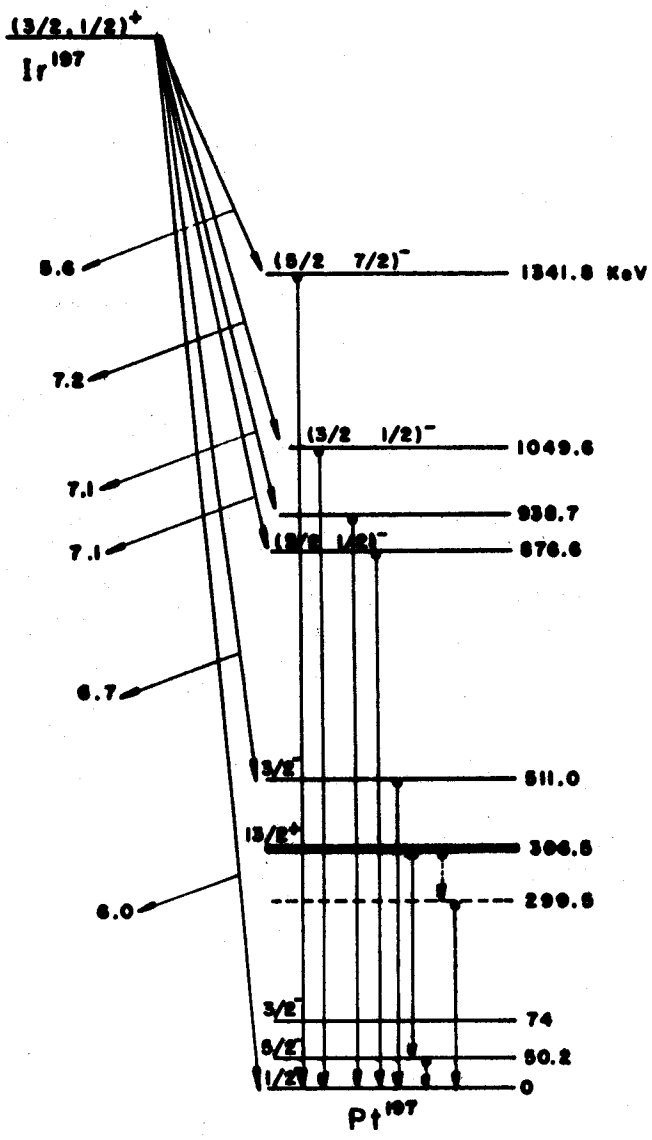
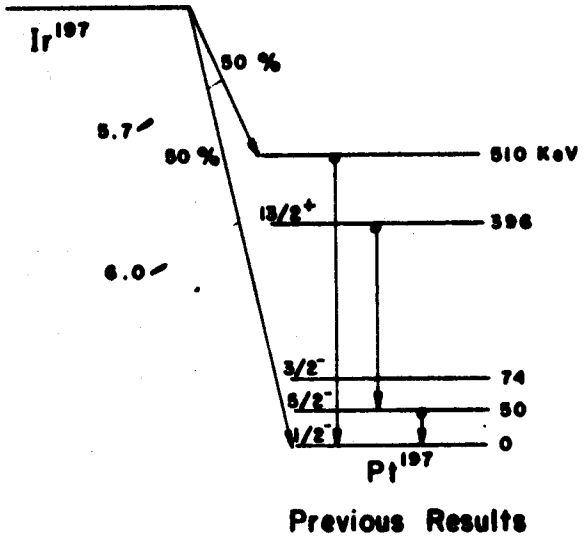


FIG. I

⊙ LONG LIVIED TRANSITION



Present Work



Previous Results

FIG. II