Study of the Spin Structure, (Ayrast States), the Induced Fission Reactions of Heavy Ions, $^{28}si(145\,MeV)+^{176}_{70}Yb\rightarrow^{204}_{84}Po\rightarrow$ Fission

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Abstract

Search our experiments Yvrvgam group 2, in Strasbourg, France, could be extracted from induced fission of compound nuclei $^{204}_{84}Po$, which dealThe heavy ions, is created, we examine the response of the ion ^{28}Si beam with energy 145 MeV accelerated by the accelerator Vivitron, we studied the bombardment of $^{176}_{70}Yb$. The accelerator at the Nuclear Research Centre (CRN) in Krvnvnbvrg, is on the outskirts of Strasbourg. $^{28}si(145MeV)+^{176}_{70}Yb\rightarrow^{204}_{84}Po\rightarrow(Tc;Nb)$. In this study, the observed spin structures (Ayrast structure) has been studied in ^{101}Tc cells.

Keywords-: *Fission induced structure Ayrast (yrast), Rorty particle kinematics moment of inertia, alignment.*

I. INTRODUCTION

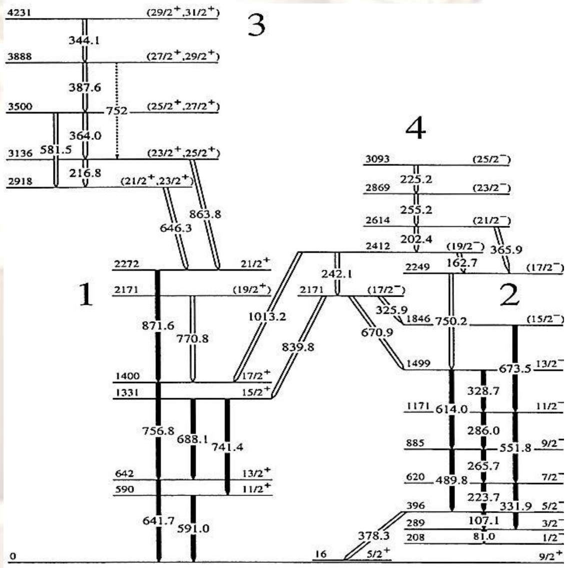
^{101}Tc contains 43 protons in the nucleus and therefore the half-filled shell, , and spherical core (Z=50) is placed. The importance of individual particles and the structure of the core excitation is collective. In fact, the collective behavior, away from closed shells(Z=50) , gradually becomes more important.

^{101}Tc Study of the four-bar schema levels in the nucleus determines that the form (1) are shown. We then describe the characteristics of these tapes and they're Nilsson levels that we have calculated and plotted to compare Bar One (1): Tape a bar that is also in the works Ayrast Savage et al [1] and Dzhbkhsh and colleagues [2] have been observed. An additional transition Yvrvgam 2 groups of 642 KeV to 771 KeV and 757 KeV have coincided with the transition And also have observed that Vahlsh level 2171 KeV. Also, assuming a power of 19.2by Dzhbkhsh et al. 2401 KeV suggested aBut the transition has not been observed 1001 KeV that is connected to the 17.2 level.

Figure 2: Calculate and plot the individual state levels Nilsson diagram for protons Hodder ^{101}Tc. (Calculated theoretically using the software Maple).

It can be seen that the levels of I(I+1), do not follow the law, but the state has an energy slightly below the level of 11/2and 15/2, respectively, are 13/2 and 17/2. This structure can be observed in the case of a spin - Parity 19/2to 2171 KeV new cases belonging to Bar 1, among others. The assignment of the

Figure 1: Schema levels, ^{101}Tc new levels



have been observed are shown by gray Yvrvgam [3]. $g_{9/2}$ fundamental mode, $I=j=9/2,(R=0)$, is considered a normalThe spherical shell model orbitals circuits $g_{9/2}$, $Z\sim 40$ are found in the vicinity of the Fermi level for Orbits close to the Fermi level from $[422]5/2^{+}$ to ^{101}Tc would be possible (Figure 2). The core ^{101}Tc in an intermediate region between the strong coupling and the coupling is weak.

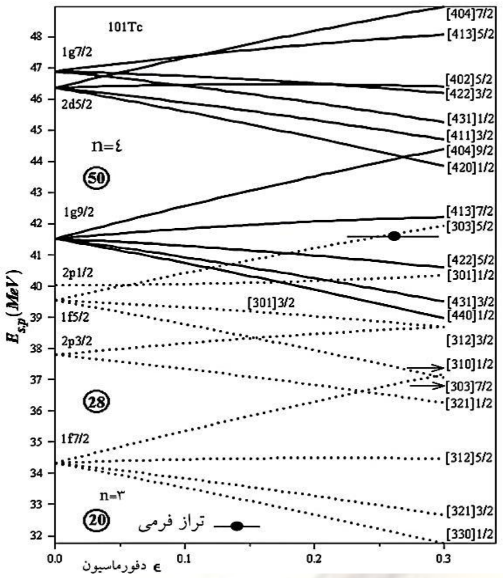


Figure 2: Different levels have been proposed by other researchers, (Dzhbkhsh et al) [1] (Savage et al) [2], in which the band structure is 2.

The transition 552 KeV and 329 KeV appear to be inconsistent at times, which can be caused by forced arousal level 1499 KeV. Hmfrvdy observed between transitions (266 KeV) and 329 KeV Transition ($13/2^- \rightarrow 11/2^-$ or), confirming the structure proposed by Dzhbkhsh et al. An additional transition 627 KeV, the additional schema proposed by Savage & Associates, has been observed. In addition, there is a level 750 KeV in Yvrvgam 2, which comes from 1499 KeV statesIf the strong-coupling first Balances Tape 2 features $\Delta I = 1$ transitions between the two levels, row, and feature $\Delta I = 2$ the transitions in parallel with the two transition, $\Delta I = 1$ we consider a spin 15/2 case, 1846 KeV and 17/2 for states with excitation energy 2171 KeV and 2249 KeV, we are

$$E_1 = E_K + A\left[I(I+1) - K^2\right] + B\left[I(I+1) - K^2\right]^2 + C\left[I(I+1) - K^2\right]^3 + \ldots$$
$$+(-1)^{I+K}\frac{(I+K)!}{(I-K)!}\left[A_{2K} + B_{2K}\left[I(I+1) - K^2\right] + C_{2K}\left[I(I+1) - K^2\right]^2 + \ldots\right]$$

By adjusting the rotational energy states by the formula above for an image K= 1/2 of the spin, we obtain the following results. Spin state with an excitation energy of 17/2 to 2227 KeV parameters that define the displacement energy at 2249 KeV, rather than2171 KeV, which is 2 in the continuum band. Alignment 2171 KeV for the Parity positive side of the bar for the transition state 840 KeV leads motivated, , And represents a different structure of this mode is the mode that has two make-up Bar $\pi P_{1/2}$ mix with other orbitals have negative Parity.

Bands 3 and 4: Modes 3 and 4 bands were first observed by Yvrvgam. 2272 KeV levels from 1 bar to 3 bar the door is raised, While the states of band 4 to band 1 and 2 are motivated force. A strong similarity between schema levels of these cores and ^{103}Ru [4], and there are ^{105}Ru [5]. For these two types of nuclei, the angular distributions or linear polarization of electromagnetic transitions are shownWhere the low-energy transitions, similar to the transitions 3 and 4 from the $^{101}Tc, \Delta I = 1$ have the same transitions. Successive transitions connecting the property to the state bar, 3 and 4 of the ^{101}Tc have also been used If you invest in an irregular feature bands 3 and 4, with the same core strips ^{103}Ru and ^{105}Ru are compared, Regular transition energy increases. Suppose that some transitions transitions (581 KeV, 752 KeV, and 365 KeV) $\Delta I = 2$ are very weak intensity have been observed 4 strips of tape to tape the number of transitions 1 and 2 are related to the Spin and Parity of the energy levels of 2249 KeV and 2412 KeV to control. The transition 750 KeV, the state will create 13/2 spin-spin energy state is limited to 2249 KeV to 17/2 because $\Delta I = 3$ is the nature of the transitionTerm survival of the excitation energy at 2249 KeV than Hmfrvdy valves used in the experiments, is very long and can be made Hmfrvdy between transitions and raised in this case it was apparent legitimate.

II. CALCULATIONS

Calculation of rotational frequency ω for the transitions between states with spin $I+1$ and I-1 by the following formula:

$$I_X(\omega) = \sqrt{I(I+1) - K^2} \approx \sqrt{\left(I + \frac{1}{2}\right)^2 - K^2} \qquad (2)$$

$$\omega(I) = \frac{dE(I)}{dI_X(I)} \approx \frac{E(I+1) - E(I-1)}{I_X(I+1) - I_X(I-1)} \qquad (3)$$

K and $I_X(\omega)$ respectively of the total spin on the axis of symmetry, and rotating images.

Rorty calculate the particle:

$$e = E'(\omega) = \frac{E_{I+1} + E_{I-1}}{2} - \omega_I I_{X,I} \qquad (4)$$

Rorty calculated quasiparticle:

$$e' = E'(\omega) - E_{ref}(\omega) = \frac{E_{i+1} + E_{I-1}}{2} - \omega_I I_{X,I} - E_{ref}(\omega) + \Delta \qquad (5)$$

$$\vartheta = \vartheta_0 + \vartheta_1 \omega^2 \qquad (6)$$

$$I_{X,ref}(\omega) = \vartheta\omega = \left(\vartheta_0 + \vartheta_1 \omega^2\right)\omega \qquad (7)$$

Nuclei with odd mass difference between the mass of the nucleus Δ couples - couples are adjacent. Calculate the static moment of inertia:

$$\vartheta_I^{(1)} = \frac{I_{X,i}}{\hbar\omega_I} \tag{8}$$

calculated from

$$\vartheta^{(1)} = \left(\frac{2}{\hbar^2}\frac{dE(I)}{dI_X}\right)^{-1} = \frac{I_X}{\hbar\omega}$$

Experimentally, we have:

$$\vartheta_I^{(1)} \approx 2\hbar^2 \frac{(I-1)}{E_\gamma} \tag{9}$$

Calculated alignment: the alignment (produced by the spin of nucleons from nuclei "quasi-particles" along the axis perpendicular to the symmetry axis) can be approximated as Subtracting the total angular momentum and spin deformed rotational nuclei acquired the remaining $I_{X,ref}(\omega)$

$$i_x = I_X(\omega) - I_{X,ref}(\omega) = I_X(\omega) - (\vartheta_0 + \vartheta_1\omega^2)\omega \tag{10}$$

$$E_{ref}(\omega) = -\int I_{X,ref}(\omega)d\omega = \frac{\hbar^2}{8\vartheta_0} - \frac{1}{2}\vartheta_0\omega^2 - \frac{1}{4}\vartheta_1\omega^4 \tag{11}$$

Core body core neighbor pair - pair near the mass Dvrranhay region is chosen to describe its behavior is given by Harris parameters [7].

III. RESULTS

We change the function of the frequency bands $\vartheta^{(1)}$ moment of inertia of rotational movement with ^{101}Tc cores couples - couple adjacent determined and compared We've (Figure 3)., ^{102}RU, started a "post-mute" is attributed to the alignment of a pair of $Vh_{11/2}$ [6].

Figure (3) increase the moment of inertia movement between bands 1 and 3 to a value of about 0.35 MeV is observed $\hbar\omega$. In addition to the core ^{100}MO and ^{102}RU of the bending phenomenon has occurred with an excitation energy of about 3MeV, Which is viewed as figure 1 of ^{101}Tc. An increased moment of inertia between bands 1 and 3 for the $\hbar\omega \sim 0/35$ is visible, which represents a phenomenon so Khmshdr These limits are.

Compared with the behavior of stem cells couples bands - even adjacent to a proposed arrangement $\left(\pi g_{9/2}(vh^{11/2})^2\right)$ and ^{101}Tc corresponding to 3 bar Therefore the pair of neutrons. Alignment of pairs of protons in the nucleus along the symmetry axis can beDespite a poor splitting attributes explained. The forms (4) and (5) experimental Rorty and alignment for the four bands observed at ^{101}Tc, $\vartheta_0 = 8\hbar^2 MeV^{-1}$ and $\vartheta_1 = 20\hbar^4.MeV^{-3}$ calculated Aymkh Harris parameters used in theFor the calculation of group values Yvrvgam K=5/2 for 1 and K=1/2 bar, a bar, 2 are compatible. For bands 3 and 4 assume that the spin of nucleons and unpaired along the line and cause a poor heart

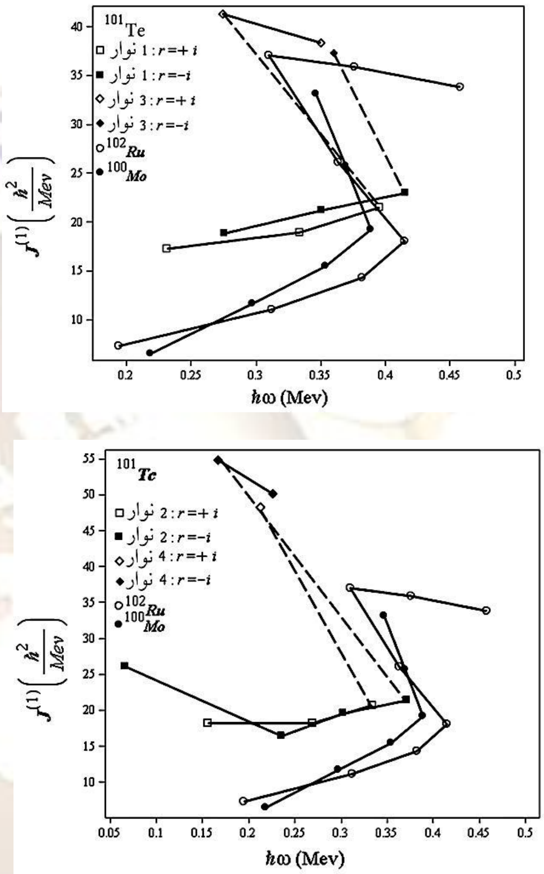


Figure 3: Calculate and plot the moment of inertia kinematic four-bar ^{101}Tc and bar core foundation of the pair - pair near ^{100}MO and ^{102}RU. the image of spin on the axis of symmetry, are. Values K= 7/2 for bands 3 and 4 are taken and the difference in mass between nuclei Couples - Couples and the core of a person charged with a fixed value of R Δ $1/3MeV$ is Rorty on the experimental plot, a characteristic important gap in the tape, one can observe that it is contrary to the other three bands. For bands 3 and 4, with a characteristic gap E2 forms transitions can be observed, indicating the possibility of weak transitions is E2 over M1 transitions.

IV. DISCUSSION

Nuclear structure observed in the ^{101}Tc four-bar displays. Tape 1 is characterized by an important gap, occupied by a single proton orbit angular momentum above j, $\pi g_{9/2}$ is assigned. $\pi p_{1/2}$ state can be occupied Negative Parity of a tab view that is strongly coupled. Two top bar polarized excitation energy of a Parity Parity positive and the other negative, are determined by Yvrvgam. These bands are, respectively, the alignment of a pair of coupling protons and $\nu h_{11/2}$ neutrons, $\pi g_{9/2}$, ^{100}Mo In the heart of the ^{101}Tc respondents to a Negative Parity States, are justified. Theoretical calculations are consistent with this explanation.

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