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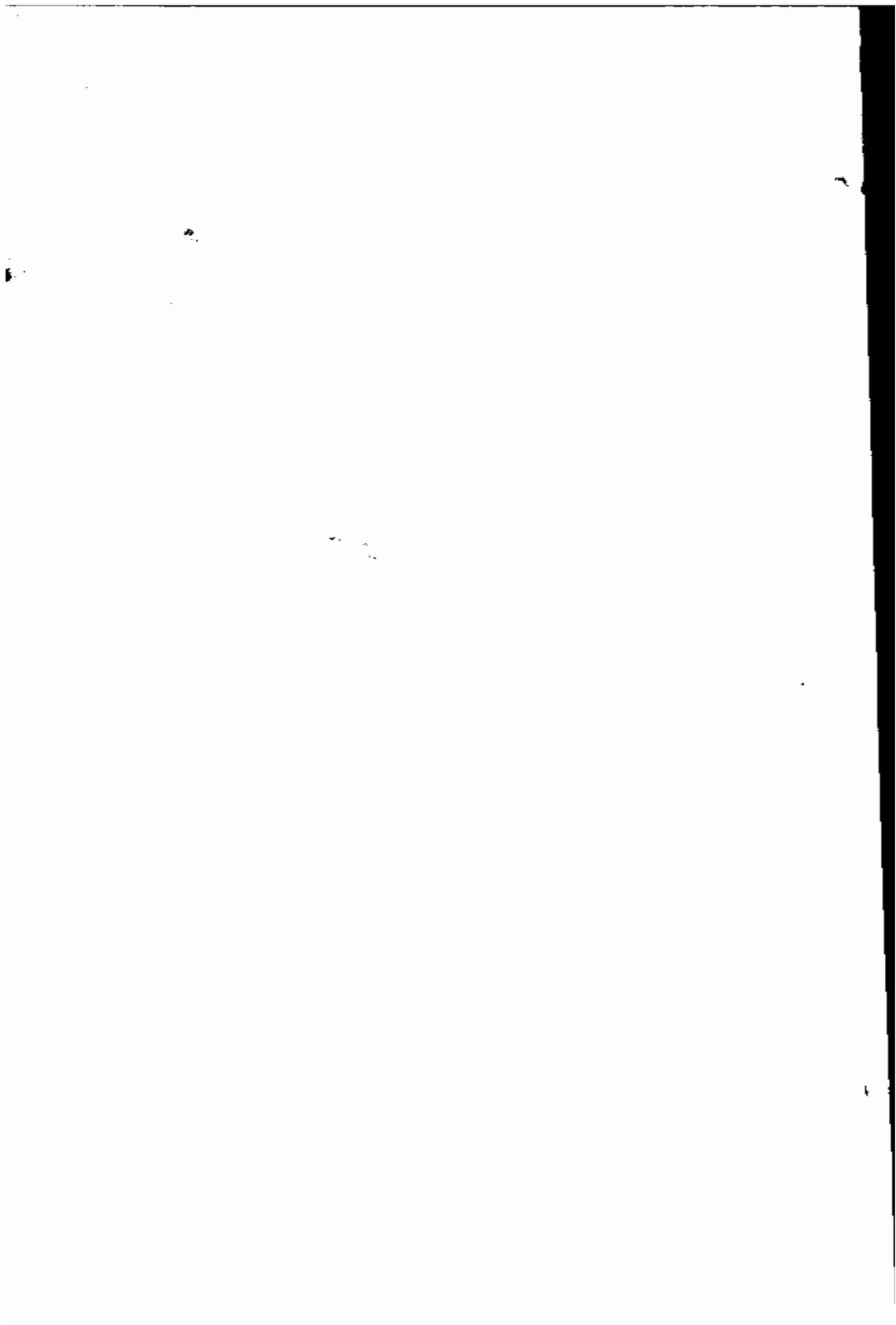
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مصطفى محمد شبله استاذ الفيزياء النووية  
ناصر محمد درويش استاذ الفيزياء النووية  
علاء محمد الناعم استاذ الفيزياء النووية  
ياسر عبد الملاح استاذ الفيزياء النووية

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علاء



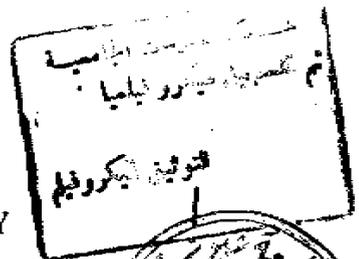


Ain Shams University  
College for Girls, Arts,  
Science and Education

## STUDY OF SOME NUCLEAR PROPERTIES OF $^{169}\text{Tm}$

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E.A.

**THESIS**  
Submitted to College for Girls  
Ain Shams University  
For the degree of  
**DOCTOR OF PHILOSOPHY**  
(Physics)



Presented by  
**Eman Abd El Hameed Abd Elkader Salem**  
M.Sc. 1989



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### Supervisors

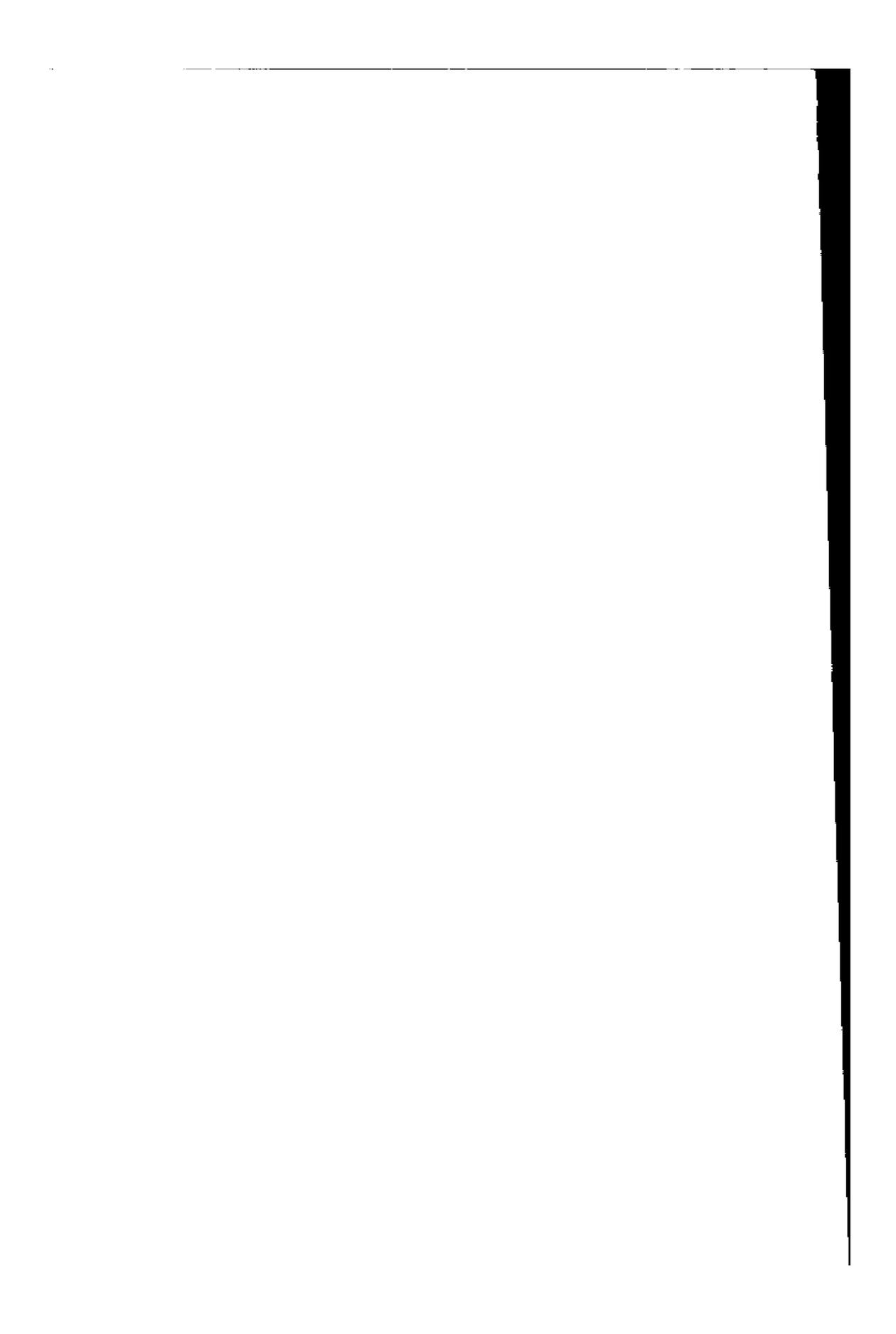
**Prof. Dr. Ali Mohamed Elnaem**  
Faculty of Computer Science and Information  
Ain Shams University

**Dr. Samia Abdel Malak**  
Assistant Professor of Physics  
Faculty of Girls  
Ain Shams University

**Dr. Magda Abdel Wahab**  
Teacher of Physics  
Faculty of Girls  
Ain Shams University

**Dr. Amany Taha Sroor**  
Teacher of Physics  
Faculty of Girls  
Ain Shams University

1997



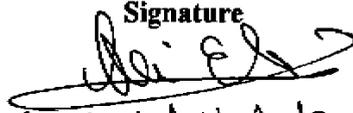
# STUDY OF SOME NUCLEAR PROPERTIES OF $^{169}\text{Tm}$

THESIS SUBMITTED FOR THE DEGREE  
OF DOCTOR OF PHILOSOPHY IN  
PHYSICS

Presented by  
Eman Abd El Hameed Abd Elkader Salem

## Thesis Supervisors

1. Dr. Ali Mohamed Elnaem
2. Dr. Samia Abdel Malak
3. Dr. Magda Abdel Wahab
4. Dr. Amany Taha Sroor

Signature  
  
Samia Abdel Malak

Date of Research :  
/ / 1990

Approval Stamp :  
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Approval of Faculty Council  
/ / 1997

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/ / 1997

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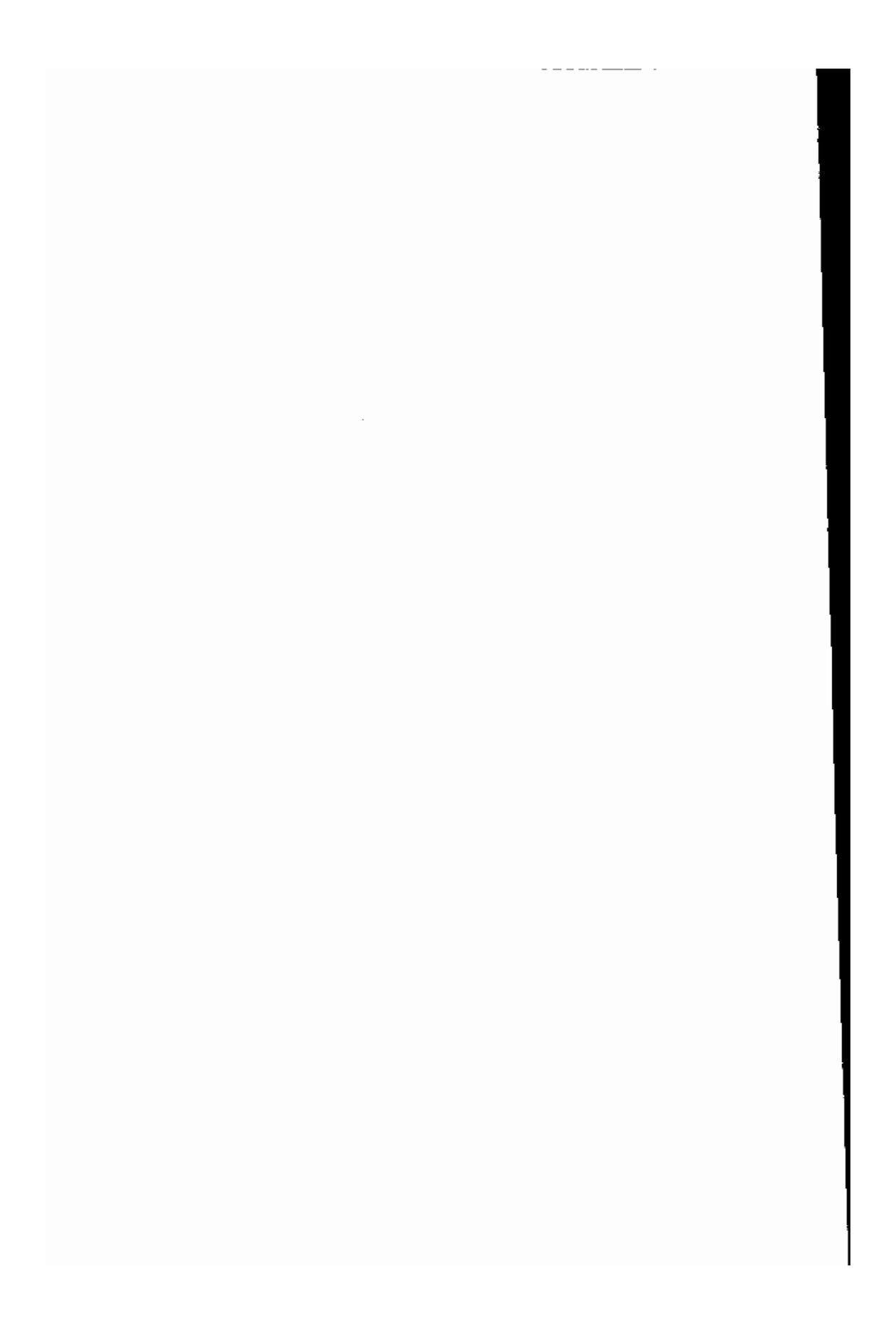


**TO MY HUSBAND**

**WHO LET ME IN REST**

**AND HELPED ME IN**

**THIS WORK**



## ACKNOWLEDGEMENTS

I kneel humbly to **GOD** thanking HIM for showing me the right path, with out HIS help my efforts would have gone astray.

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Assistant Prof. Nuclear Physics.
3. **Dr. Magda Abdel Wahab**  
Teacher Nuclear Physics.
4. **Dr. Amany Taha Sroor**  
Teacher Nuclear Physics.

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The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every receipt, invoice, and bill should be properly filed and indexed for easy retrieval. This is particularly crucial for businesses that deal with a large volume of transactions, as it helps in identifying discrepancies and ensuring compliance with tax regulations.

Next, the document outlines the various methods used to collect and analyze financial data. This includes the use of spreadsheets, databases, and specialized software. The author highlights the benefits of automation in data collection, which reduces the risk of human error and saves time. Additionally, the document discusses the importance of regular audits to ensure the accuracy and integrity of the financial records.

The third section of the document focuses on the analysis of financial data. It provides a detailed explanation of how to interpret various financial ratios and metrics, such as the current ratio, debt-to-equity ratio, and return on investment. The author also discusses the importance of comparing these metrics over time and against industry benchmarks to gain a better understanding of the company's financial health.

Finally, the document concludes with a discussion on the future of financial reporting. It highlights the growing importance of transparency and the use of technology to enhance the accuracy and reliability of financial data. The author predicts that the use of artificial intelligence and blockchain technology will revolutionize the way financial data is collected, analyzed, and reported in the coming years.

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## ABSTRACT

The decay of  $^{169}\text{Yb}$  by electron capture to  $^{169}\text{Tm}$  was studied using two hyper pure Germanium detectors in singles and fast-slow coincidence spectrometers, together with a HP Ge-NaI (TI) coincidence spectrometer.

From the present singles and coincidence results fifty six gamma transitions have been attributed to the decay of  $^{169}\text{Yb}$  to  $^{169}\text{Tm}$ , four of which at energies 96.99, 191.37, 211.59 and 216.50 keV were observed for the first time and confirmed in the  $\gamma$ - $\gamma$  coincidence measurements to follow the decay of  $^{169}\text{Yb}$ .

A new position was proposed to the 336.33 keV transition proposed by previous authors. Five of the seven gamma transitions proposed by ref.(3) were confirmed, five of the eight transitions proposed by ref. (49) and latter in the data of ref.(42) were confirmed in the present work and eleven of the twenty two transitions present only in ref.(42) were confirmed according to the present singles and/or coincidence results.

The gamma ray energies, relative intensities and total intensities were determined. The electron capture branching ratios were obtained based on the present gamma ray intensities, the internal conversion corrections for the gamma ray transition intensities were obtained using either the internal conversion coefficients reported previously(42) or calculated using the theoretical values of ref.(29), the log (ft) values were deduced as well.

Theoretical calculations for energy states of  $^{169}\text{Tm}$  has been given using two methods : strong coupling method in terms of angular momentum expansion and for the first time particle-core coupling method assuming  $\gamma$ -deformation effect in addition to the  $\beta$ -deformation effect.

In the present work, the strong coupling method neglecting coriolis effect is used to study the level structure of the positive parity bands  $1/2^+$  [411],  $3/2^+$  [411] and  $7/2^+$  [404] and the negative parity

bands  $1/2^-$  [541] and  $7/2^-$  [523]. A good agreement with experimental results is obtained.

The  $\gamma$ -deformation effect on energy states is studied. The value of  $\gamma$  is calculated from the states  $2^+_{1}$  (0.0798 MeV) and  $2^+_{2}$  (0.8211 MeV) and  $3^+_{1}$  (0.8957 MeV) in the core  $^{168}\text{Er}$  and is found to be 11.50. Assuming that

$$^{169}\text{Tm} = ^{168}\text{Er} + \text{P}.$$

The positive and negative parity bands in the nucleus  $^{169}\text{Tm}$  are studied for the first time assuming  $\gamma$ -dependent effect of moment of inertia on the excited energy states of the required bands. These theoretical calculations are done using the FORTRAN Program AR02. The calculation of positive parity bands  $1/2^+$  [411] and  $7/2^+$  [404] build on the  $2d_{3/2}$  and  $1g_{7/2}$  single particle states, the results of variation of energy states with  $\lambda$  for the ground state band indicate that  $\lambda$  is positive in order to obtain the experimental spin sequence of that band.

The negative parity bands  $1/2^-$  [541] and  $7/2^-$  [523] are also calculated using the AR02 program. The results are in good agreement with experimental results. Calculations indicate that  $\lambda$  is negative and the  $\gamma$ -values are relatively small varied from that of positive parity states which indicates that the nucleus  $^{169}\text{Tm}$  is not statistically stable against  $\gamma$ -deformation.