





*Ain Shams University  
Faculty of Women for Arts,  
Science and Education  
Physics Department*

**"Comparative Studies Between  $\alpha$  and  $\gamma$  -Techniques for  
Measuring Radionuclides and it's Radiological Hazards  
in  $^{238}\text{U}$  Decay Series on Sedimentary Rock Samples,  
Sinai, Egypt"**

*Presented By*

**Reham Samir Attia Azaz**

**Bachelor of Science in Physics (2015)**

*Thesis*

**Submitted in the Partial Fulfillment**

**for M.SC. Degree of Science in (Radiation Physics)**

*To*

**Physics Department**

**Faculty of Girls for Arts, Science and Education**

**Ain Shams University**

*Under Supervision of*

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(2022)



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## **APPROVAL SHEET**

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**Thesis Title:** " Comparative Studies Between  $\alpha$  and  $\gamma$  -Techniques for Measuring Radionuclides and it's Radiological Hazards in  $^{238}\text{U}$  Decay Series on Sedimentary Rock Samples, Sinai, Egypt "  
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# *Dedication*

# DEDICATION

*To*

*My Parents (Father and Mother),*

*My Second Father (Monir),*

*My Husband (Mohamed),*

*My Sisters and Brother*

*And*

*My Daughter (Mariam)*

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guidance, and continuous encouragement, useful comments and fruitful discussions in order to bring out this work in its current form.

I would also like to express my sincere thanks and gratitude to my supervisor, **Dr. Eman Samir Abd-El Moaty Abd-El Halim** Lecture of Nuclear Physics, Faculty of Women for Arts, Science and Education, Ain Shams University, for her supervision, guidance and advice throughout this work and for encouragement to go ahead with my work.

Finally, I want to express my best thanks to all those who helped me to finish this work.

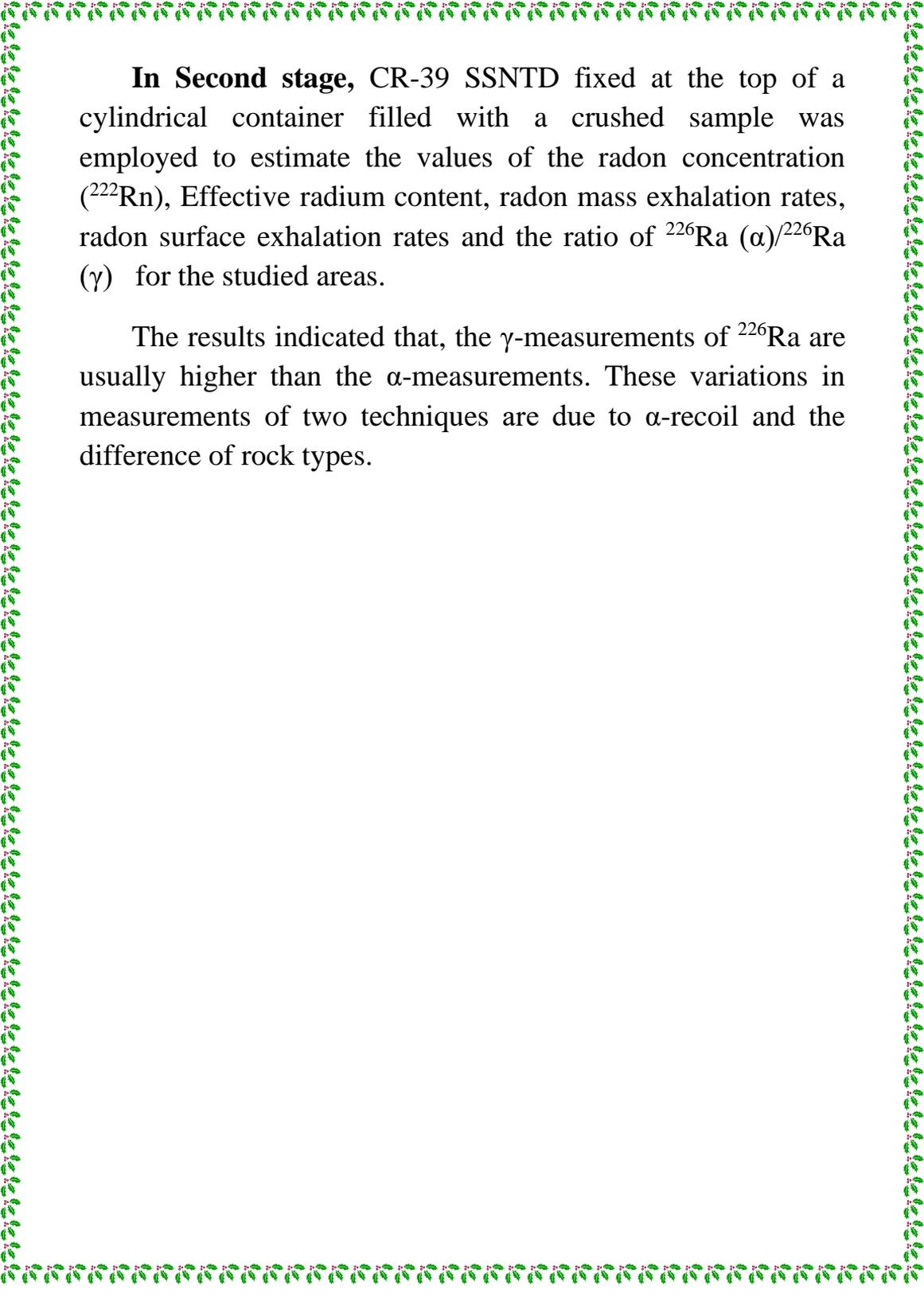
# *Abstract*

# ABSTRACT

The main target of this study is to find the comparative studies between  $\alpha$  and  $\gamma$ -techniques for measuring radionuclides and its radiological hazards in  $^{238}\text{U}$  decay series for different sedimentary rock samples from southwestern Sinai, Egypt. First, find out the natural radioactivity by using high purity germanium detector (HpGe) and an account the radiological risks. Second, measuring the concentration of the emitted radon by the solid state nuclear track detector (CR-39) and comparing between the two results for  $^{226}\text{Ra}$  concentration.

The sample locations, collection methods and preparation procedures have been discussed. Ten samples of sedimentary rocks were collected from different three locations: 4 samples from Dabbet Abu Thor location, 3 samples from Wadi Um Hamd location and 3 samples from Gabal Farsh El Azrak location.

**In First stage**, the activity concentrations (Bq/kg) of the naturally occurring radionuclide's  $^{238}\text{U}$ ,  $^{235}\text{U}$ ,  $^{234}\text{U}$ ,  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$ , and  $^{40}\text{K}$  were measured by using high purity germanium detector (HpGe) and the activity ratios  $^{234}\text{U}/^{238}\text{U}$ ,  $^{226}\text{Ra}/^{238}\text{U}$ ,  $^{238}\text{U}/^{235}\text{U}$ ,  $^{234}\text{U}/^{235}\text{U}$  were calculated to estimate the radioactive equilibrium/disequilibrium in the area under study, also the radiation hazard indices were calculated. The results demonstrated high concentrations of the natural radioactivity and the associated hazard indices.



**In Second stage,** CR-39 SSNTD fixed at the top of a cylindrical container filled with a crushed sample was employed to estimate the values of the radon concentration ( $^{222}\text{Rn}$ ), Effective radium content, radon mass exhalation rates, radon surface exhalation rates and the ratio of  $^{226}\text{Ra}$  ( $\alpha$ )/ $^{226}\text{Ra}$  ( $\gamma$ ) for the studied areas.

The results indicated that, the  $\gamma$ -measurements of  $^{226}\text{Ra}$  are usually higher than the  $\alpha$ -measurements. These variations in measurements of two techniques are due to  $\alpha$ -recoil and the difference of rock types.

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