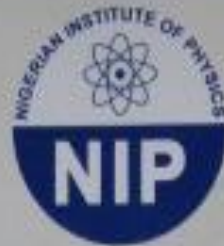


BOOK OF ABSTRACTS
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NIGERIAN INSTITUTE OF PHYSICS (NIP)



Annual CONFERENCE

THEME:

**PHYSICS AND THE SUSTAINABLE
DEVELOPMENT GOALS**

BOOK OF ABSTRACTS

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Abstract

The collective nuclear structure $N=28-50$ and $Z=28-50$ atomic nuclei is studied by using the energy of the ground state band. We discuss the nuclear structure using the observables of collectivity of the energies of first excited 2^+ states ($E2g^+$), energy ratio $R4/2$ ($=E4g^+/E2g^+$) and the ground state moment of inertia ($\theta = 1/E2g^+$) quadrant wise, which shows remarkable correlations. The experimental data is taken from (<http://www.nndc.bnl.gov/ensdf>, 2016). The whole data is divided into four quadrants: quadrant I for $N=28-38$ and $Z=28-38$, which has neutron particles and proton particles called pp space; quadrant II for $N=28-50$ and $Z=28-38$, which has neutron particles and proton holes called ph space; quadrant III for $N=40-50$ and $Z=28-38$, which has neutron holes and proton particles called nh space; and quadrant IV for $N=40-50$ and $Z=40-50$, which has neutron holes and proton holes called hh space. We find that the quadrant wise presentation of deformation observables, i.e. $E2g^+$, $R4/2$ and the ground state band moment of inertia (θ) is very informative about the nuclear structure.



HARMONIC OSCILLATOR MODEL FOR COMPUTATIONAL ANALYSIS OF TISSUE ELASTICITY USING MODIFIED BLOCH NMR FLOW EQUATION

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ABSTRACT

Visualization of MRI system as harmonic oscillator provides a great insight into relationship between oscillating nuclei and tissues elasticity under the influence of effective magnetic field. This study uses Modified Bloch NMR flow equation by placing appropriate restriction on the system to characterize the displacement function for the investigation of wavelength, velocity and tissue elasticity relation. The displacement of harmonic oscillator wave function in tissue was found to be strongly dependent on wavelength and velocity of propagated wave, as it indicates the elastic nature of the tissue under investigation. Therefore, spatial distribution of oscillator signal as it passes through different regions in a material can be utilized to map tissue elasticity. The total oscillator signal was expressed to be the product of transverse wave function (Hermite Polynomial) and exponential function to explore the unique property of Hermite polynomial to represent signal both in spatial and Fourier domain for fast and robust image processing in spatial and image domain. Further studies are required to test the theories and mathematical formulations using actual moving phantoms in MR scanners and optimization of NMR parameters should be carried out using designed and constructed mechanical actuator.

Keywords: Bloch NMR flow equation, Harmonic oscillator, Magnetic resonance imaging, Tissue elasticity