Shell Model Calculations of $^{106-114}$Te

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Introduction

The neutron deficient nuclei near doubly closed shell (Z=50 and N=50) are subject of considerable interest due to various features such as, shell evolution [1-3], transitions in collectivity [4], magnetic and anti-magnetic rotation [5]. The shell model and its various modified versions have been successfully used for explaining the structures of these nuclei because due to less complex interactions of valance particles near doubly closed shell (Z=50 and N=50) nuclei.

Previously shell model calculations were reported for ^{106,108}Te [6] using renormalized two body effective interaction from the CD-Bonn free nucleon-nucleon potential [7] and also even-even $^{116-130}$Te nuclei [8] using un-normalized two body effective interactions based on Bonn A, B, and C free N-N potential [7]. These calculations show a reasonable agreement with the experimental data. However in the case of neutron deficient $^{108-114}$Te nuclei no attempts were made to understand the structure of low lying states by using the shell model. Therefore, in present work, shell model calculations have been carried out for neutron deficient $^{106-114}$Te nuclei.

Results and Discussions

In this work shell model calculations have been carried for $^{106-112}$Te nuclei using the computer code NuShellX@MSU [9]. The details of the calculations will be presented during the symposium, only results are discussed here. The excited states up to 6^+ were investigated using the effective interaction sn100pn [10], in the present shell model calculation. The model space $0g_{7/2}$, $1d_{5/2}$, $1d_{3/2}$, $2s_{1/2}$, $0h_{11/2}$ for valance neutrons and $0g_{7/2}$, $1d_{5/2}$, $1d_{3/2}$, $2s_{1/2}$ for valance protons (with $h_{11/2}$ truncation) has been used. The energies of the excited states and reduced transition probability B(E2) have been calculated and results are compared with the available experimental data, as shown in figure 1.

The results show good agreement with the experimental data for ^{106}Te nucleus. In the case of ^{108}Te nucleus, reasonable agreement has been observed for 2^+ and 4^+ states. The calculated energy of the 6^+ state is found lower than the value experimentally observed. Systematically, calculated energies found decreasing compare to the experimental energies for 4^+ and 6^+ states in for $^{110-114}$Te nuclei (figure 2).

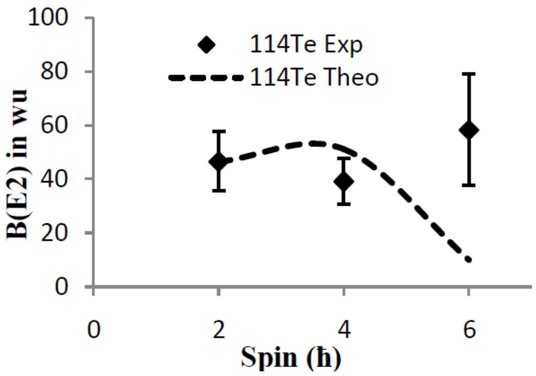

Figure1: Shows a comparison between experimentally observed B(E2) values with calculated values for ^{114}Te nucleus as a function of spin.

The reduced transitional probability *B(E2)* have been calculated and compared with the experimental *B(E2)* values for ^{114}Te. The calculated value agrees for ($2^+ \rightarrow 0^+$) transition, but show deviation for ($4^+ \rightarrow 2^+$), and ($6^+ \rightarrow 4^+$) transitions (Figure 1).

Therefore, the reason of deviation in the present work for Te-isotopes, for 4^+ and 6^+ states require more investigations for the understanding of the structure of these states.

Hence, further investigation is under way and results will be discussed during the symposium.

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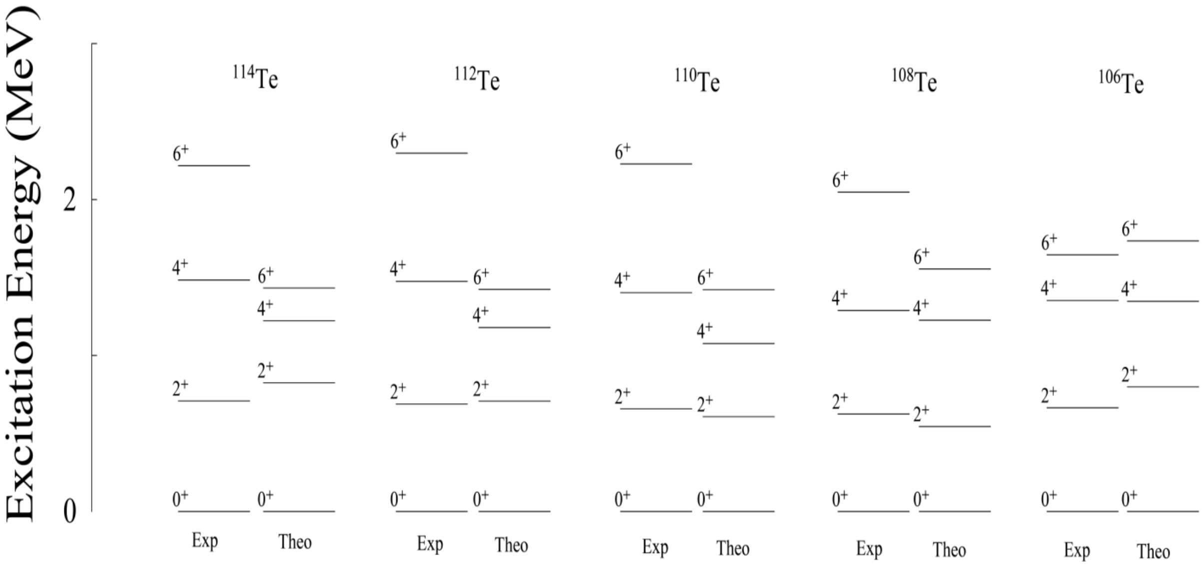
Figure 2: Plot shows the experimental (Exp) and calculated (Theo) level energies of $^{106\text{-}114}$Te nuclei, using NuShellX@MSU.



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