High Spin States in ^{86}Sr and their discription using Shell Model calculations

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Introduction

The properties of the nuclei around the shell closure at N = 50 vary drastically with small changes of the nucleon numbers. Low-spin states in N = 50 nuclei are not collective, as indicated by measured low transition strengths of B(E2). On the other hand, nuclei with two holes in the N = 50 shell show an onset of collectivity, which manifests itself in regular level sequences at low spin and moderate transition strengths of B(E2). The previousely, the high-spin states of ^{86}Sr has been studied usin ^{84}Kr(α,2n)^{86}Sr reaction and ^{76}Ge^{76,74}Ge(^{16,18}O,α3n)^{86}Sr. In this work we are reporting for high-spin state of ^{86}Sr populated by ^{76}Ge(^{13}C,3n)^{86}Sr reaction first time. The spin and parity of new observed states has been obtained using polarization asymmety and directional correlation measurement.

Experimental Details

The spin states of ^{86}Sr were populated in the ^{76}Ge(^{13}C,3n)^{86}Sr reaction at a beam energy of 45 MeV obtained from the 14 UD Pelletron at TIFR-BARC Pelletron Facility at TIFR Mumbai. A ^{76}Ge target of thickness $\approx$ 850μg/cm^2 (isotopically enriched to 99.90%) with a backing of ^{181}Ta (thickness $\approx$ 7.04 mg/cm^2) was used. The gamma-rays were detected using Indian National Gamma Array (INGA). The array consists of 15 Compton-suppressed clover detectors arranged in spherical geometry with 3, 2, 2, 4, 2 and 2 number of clovers placed at 157°, 140°, 115°, 90°, 65° and 40° with respect to the beam direction, respectively. The distance from the target to crystal is 25 cm. The data was collected in list mode using a PCI-PXI digital data acquisition (DDAQ) system with 112 channels using Pixie-16 Module by XIA-LLC Software. A total of about 1.2 X 10^9 two and higher fold events were recorded. The coincidence events were sorted into a $\gamma-\gamma$ matirx and cube and were analyzed with the RADWARE software package. The other matrices were made to get DCO and polarization asymmetry.

Results and Discusion

The level scheme of ^{86}Sr resulting from our-in-beam study is shown in Fig. 1. The negative parity states of level scheme have been obtained first time in our work. The $\gamma-\gamma$ and $\gamma-\gamma-\gamma$ coincidence analysis has carried out to extend the level scheme for negative party states. The new structure placed between 3052 keV and 4975 keV are very complex and a lot of coincidence and anti-coincidence relationship has been worked out to conclude this complex structure. This analysis is only possible with cube data. The spin and parity has been asigned using the values of the

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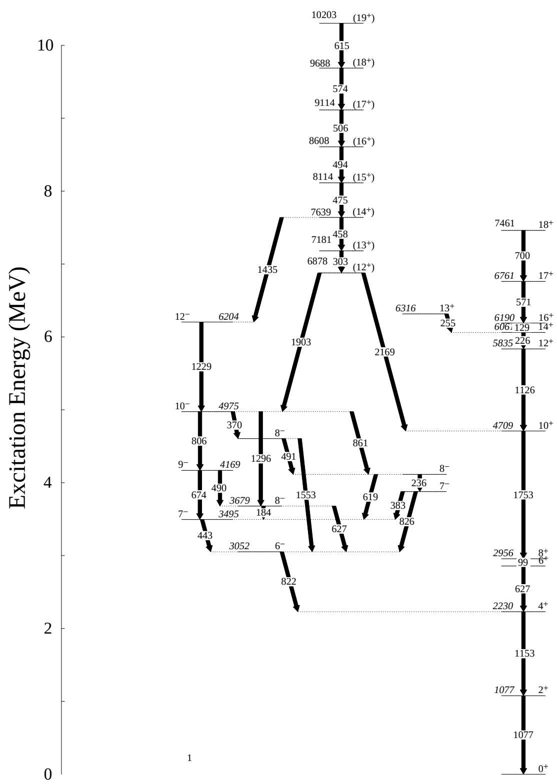

FIG. 1: Partial Level scheme of Sr-86 obtained from the present work. All the negative parity states are obtained in present work

DCO ratios and polarization asymmetry, But the for level above 6878 keV need to calculate the DCO ratios and polarization asymmetry.

Both the positive as well as the negative parity states up to highest observed excitation energy and spins indicate the dominance of single particle excitation in this nucleus. Therefore, the high spin states in this ^{86}Sr provided a testing ground of the predictions of the shell-model calculations with different residual interactions. The observed states are compared with the state-of-the-art shell-model calculations in different model spaces. The results of JUN45 and jj44b interaction for f5/2 pg9/2 space are showing overall good

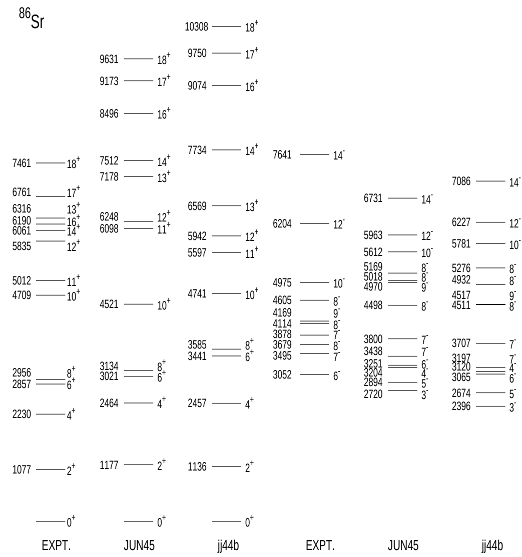

FIG. 2: Comparison of the experimental resutls with shell model calculation.

agreement with experimental data as showm in Fig. 2..

The further analysis of the work is in progrss.

Acknowledgments

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