Negative Parity States in ^{86}Sr

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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

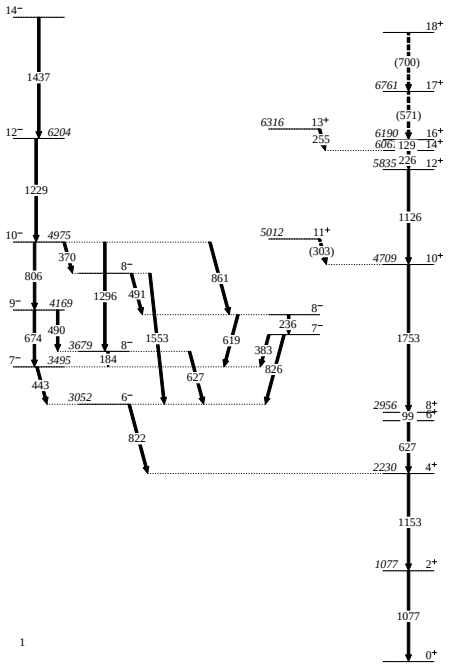

FIG. 1: Partial Level scheme of Sr-86 obtained from the present work. All the negative parity states are obtained in present work

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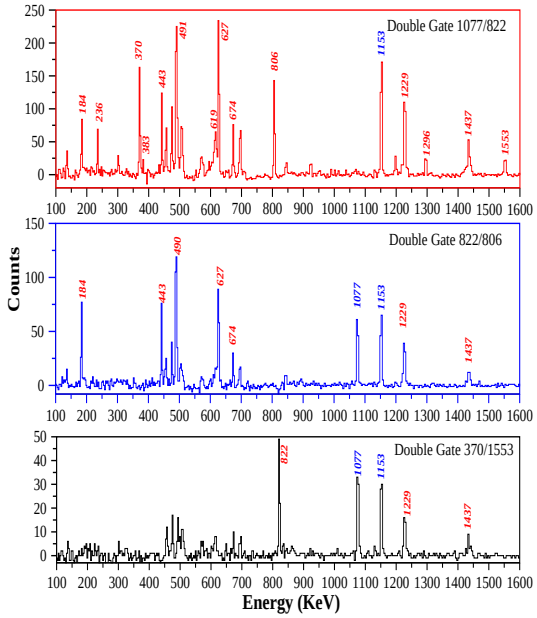

FIG. 2: Example of double gated spectrum for the γ-rays belong to ^{86}Sr.

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 data was sorted using in-house programs and analysed by software DAMM. 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 double gated spectra are shown in Fig. 2. In the double gated spectra of 822/1077 (upper panel), all the gamma-rays placed above 3052 are shown along with the yrast transition. The anti-coincidence has been shown (midle and lower panel) of Fig. 2, double gate of 806/822 and 370/1553, respectively. The spin and parity has been asigned using the values of the DCO ratios and polarization symmetry. The structure above 10^-(at 4975 keV) is expected as a oblate structure with the $\pi(g_{9/2}, p_{1/2}) \otimes \nu(g_{9/2})^{-2}$ configuration. Further analysis is in progress.

Acknowledgments

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