

## The spectroscopy of the low- and medium excited spin states in Samarium-148 nucleus

The low- and intermediate spin states in the  $^{148}\text{Sm}$  nucleus have been populated using the  $^{148}\text{Nd}(^4\text{He}, 4n)^{148}\text{Sm}$  fusion reaction at the iThemba Laboratory for Accelerator Based Sciences (LABS) using the AFRODITE  $\gamma$ -ray spectrometer comprising of 9 high-purity germanium detectors (HPGe), with detectors mounted at an angle of  $90^\circ$  and 4 at  $135^\circ$  with respect to the beam direction. The current study confirms the alternating parity structures that have been observed and reported by previous authors. weakly populated states have not been confirmed and have not been included in the deduced decay scheme. The data analysis has been done on the basis of the rad-ware  $\gamma$ - $\gamma$  coincident data analysis technique. From the present data analysis, the level scheme has been added with approximately 15 new  $\gamma$ -ray transitions, and a few adjustments have been made on both low and intermediate spin states. The previously reported  $\gamma$ -band heads have also been further investigated, and the present analysis partially agrees with some of the proposed  $\gamma$  band heads; however, no new structures have been observed on top of the  $\gamma$ - band head. This work has further conducted a systematic comparison of the even-even isotones in the  $N = 86$  region to further confirm the behavior of transitional nuclei. This study has observed that the  $^{148}\text{Sm}$  and its neighboring isotones exhibit the characteristics of spherical and vibrating nuclei; such behavior gives rise to mixed nuclear excitation. An improved  $\gamma$ -ray spectrometer with augmented low- and high-photon detectors would provide more information about the  $\gamma$ - bands observed in  $^{148}\text{Sm}$  nucleus.

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**Session Classification:** Nuclear Physics Measurements - Home and Away