

.Lifetime measurements in ^{44}Sc excited states using LaBr_3 :(\text{Ce}) detectors coupled with the AFRODITE Array

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The progressive development of the scintillator detectors has made it possible to do direct electronic lifetime determination. The $2'' \times 2''$ LaBr_3 :(\text{Ce}) detectors provide a combination of excellent time resolution and good energy resolution. With these detectors it is possible to perform direct lifetime measurements of excited nuclear states up to a few hundred picoseconds. Six $2'' \times 2''$ LaBr_3 :(\text{Ce}) detectors were coupled to the AFRODITE array as their first in-beam experiment. AFRODITE consisted of eight HPGe clover detectors as well two $3.5'' \times 8''$ LaBr_3 :(\text{Ce}) detectors. A dE-E particle telescope was used to select the desired reaction channel. All detectors were used conjunction with the 16 channel all-digital waveform acquisition card, PIXIE16.

The reaction of interest $^{45}\text{Sc}(p,d)^{44}\text{Sc}$ was carried out at a beam energy of 27MeV. Through this reaction, excited states that have lifetimes which are apt for the characterization of the $2'' \times 2''$ LaBr_3 :(\text{Ce}) detectors were populated. One of the nuclei of interest in this work, ^{44}Sc , has states with a wide range of lifetimes at low to moderate energies. Various techniques such as the slope method and the centroid shift method have been employed to extract the lifetimes of excited states. All these endeavours will seek to unveil the quadrupole moment of nuclei and their intrinsic behaviour.

Primary authors: Mr MSEBI, Lumkile (UWC, iThemba LABS); Dr JONES, Pete (iThemba LABS); Prof. SHARPEY-SCHAFER, John (UWC); Mr INGERBERG, Vetle (University of Oslo); Dr WIEDEKING, Mathis (iThemba LABS); Dr LAWRIE, Elena (iThemba LABS); Mr AVAA, Abraham (iThemba LABS, WITS); Mr ZIKHALI, Bonginkosi (UWC, iThemba LABS); Mr CHISAPI, Maluba (iThemba LABS, Stellenbosch University); Mrs KENFACK, Doris (iThemba LABS, Stellenbosch University); Ms BASHIR, Munirat (Stellenbosch University); Mr BRITS, Christian (iThemba LABS, Stellenbosch University); Mr MALATJI, Kgashane (iThemba LABS, Stellenbosch University); Dr MAQABUKA, Bongani (iThemba LABS, UWC); Mr NONCOLELA, Sive (UWC, iThemba LABS); Mr MAKHATHINI, Lucky (iThemba LABS, UWC); Dr SHRINDA, Obed (iThemba LABS, Stellenbosch University); Dr NDAYISHIMYE, Joram (iThemba LABS); Mr NETSHIYA, Adivhaho (UWC, iThemba LABS)

Presenter: Mr MSEBI, Lumkile (UWC, iThemba LABS)

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