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The design and simulation of a new experimental set up for measuring short nuclear level lifetimes

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Abstract content
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Nuclear level lifetime measurements provide information important both for nuclear astrophysics and nuclear structure studies. The lifetime of a state provides its width as well as transition strengths to other states. The widths of the relevant states are directly related to capture reactions in stars, as the energy distribution of the resonance directly influences the nuclear reaction rates, while the transition strengths provide a measure of the matrix elements connecting the states. The latter offers useful complementary information to Coulomb Excitation (CoulEx) experiments for investigations of nuclear shapes.

In this talk I describe the design and simulation of a new experimental set up to be used at iThemba LABS for lifetime measurements using inverse-kinematics and a Doppler shift method. The design was made using the Solid Edge ST6 software package for computer-aided design (CAD), with particular emphasis on providing a clean environment in which the reactions can take place. I will briefly discuss the practical considerations of the design and a Monte Carlo code to generate gamma-ray line shapes expected from particular experiments. This code aims to better understand the sensitivity of our set up and potential systematic effects.

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