MSc Progress

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Overview

MSc Thesis (preliminary) title: Lifetime measurements on ^{182}W using the Doppler Shift Attenuation Method (DSAM)

The data used for the experimental analysis where collected at the facility IFIN-HH in Bucharest Romania, with the use of the 9MV Tandem accelerator coupled with the RoSPHERE detector array.

The excited states of the nucleus of interest where populated by the following Fusion-Evaporation reaction at 38MeV/36MeV beam energies

$$^{9}Be + \ ^{176}Yb \ \Rightarrow \ ^{182}W + \ 3n$$


Brief Comment on DSAM

This method (relieable for nulear lifetimes in the fs to ps range) relies on the Doppler shift of the gamma rays emitted by the excited nucleus while it travels inside the target. The shift of the energy depends on the velocity of the nucleus as well as the relative angle of the detector with respect to the incoming velocity v_0

$$E(\gamma)_{shifted} = E(\gamma)_{unshifted}(1 + \frac{v_0}{c}F(\tau)cos\theta)$$

Here $F(\tau)$ is called the Doppler shift attenuation factor which can be calculated both experimentally and through simulations. If we consider the target as a homogeneous medium then the attenuation factor is represented through the Fourier expansion[1]

$$F(\tau) = (\tau\beta_0)^{-1} \int \beta(t) e^{-\frac{t}{\tau}} \langle cos\phi \rangle dt$$

[1] **elenkov˙two-target˙1984**.

Analysis preliminary results

According to theory what's expected in our gamma spectra is a "stopped" as well as a "flying" component (in the form of another peak or a bump)

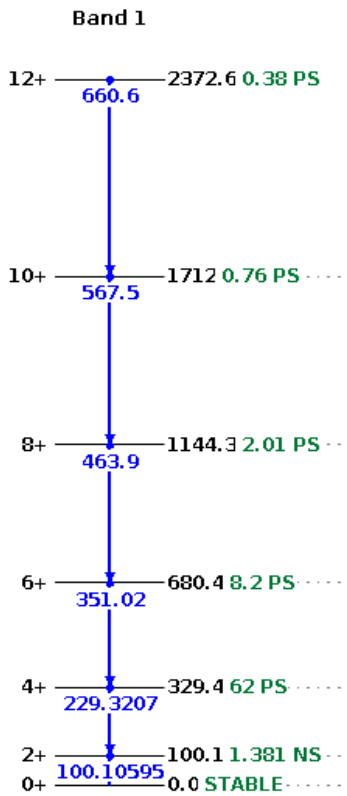
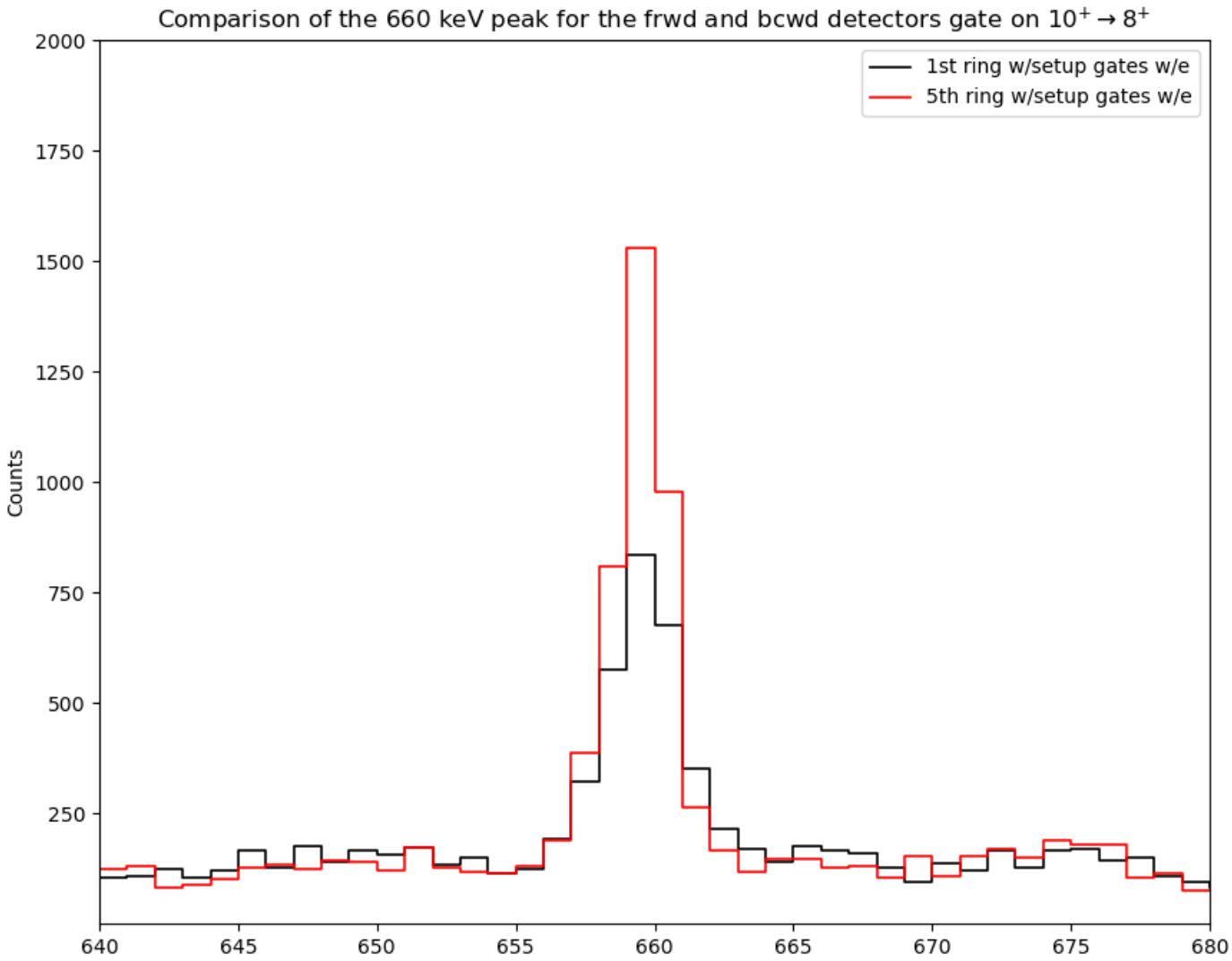


Figure: Ground state band of ^{182}W

Spectrum ^{182}W



Spectrum ^{176}Yb