

Project for the final oral examination of PHY981

Studies β decay of ^{16}N

The aim of this project is to perform shell-model calculations of the nuclei ^{16}O and ^{16}N , studying the low-lying excited states and performing β -decay studies using Alex Brown's shell-model program NushellX.

The explicit task is thus to

1. Give a survey of β -decay experiments performed in this mass region. Motivate the importance of studies of β -decay in this mass region.
2. Perform shell-model studies of low-lying states of the above nuclei using both the $0p$ and the $1s0d$ shells. You may need to perform truncations of the basis by leaving out specific single-particle states (for example the $0d_{3/2}$ state).
3. Go through the details in chapter 7.4 of Suhonen and convince yourself about the correctness of equations (7.86)-(7.102). Present also other theoretical studies.
4. Calculate thereafter, based on your shell-model states, the relevant β -decays. Give a critical analysis of your results and compare with existing theoretical studies and experiments.