Title: Interplay between proton-neutron pairing and deformation: study of the ^{48}Cr(p,^{3}He)^{46}V two-nucleon transfer reaction

Keywords: Nuclear structure, Transfer reaction, Proton-neutron pairing, N=Z nuclei, Radioactive beam, Charged particles detector, γ-ray detector

Abstract: The advent of radioactive beams shook the established knowledge on the atomic nucleus, requiring the development of new theoretical models. In particular, the understanding of collective effects plays an important role in nuclei far from magic numbers. This thesis aims at studying one of these phenomena, pairing, and the more specific case of proton-neutron pairing. The latter, specific to nuclei close to $N = Z$, can exist in two different channels, the isovector one ($T = 1$) and the isoscalar one ($T = 0$). The understanding of proton-neutron pairing is a key element for models of $N = Z$ nuclei. The method used in this work to study proton-neutron pairing is the proton-neutron pair transfer reaction from ^{48}Cr to ^{46}V, two $N = Z$ nuclei. As ^{48}Cr is in the middle of the $f_{7/2}$ shell, it is the most favorable case to study pairing in the fp-shell, the largest shell available for this type of reactions. Moreover, its important deformation makes it a perfect case to study the interplay between pairing and deformation. The measurement of the ^{48}Cr(p,^{3}He)^{46}V reaction was performed at GANIL with a 30 MeV/u ^{48}Cr beam produced by fragmentation of a stable ^{50}Cr in the LISE spectrometer, before impinging on a CH_2 target. The experimental setup used was the one of the MUGAST@LISE campaign. This detection setup was made of MUST2 light particle detectors, EXOGAM germanium γ-ray detectors, CATS beam detectors and a Zero Degree Detection. The high selectivity and precision of this experimental setup allowed to identify the different states populated in the outgoing ^{46}V nucleus, and to extract the angular distribution and absolute cross section of the reaction channels. The comparison of the experimental results with the theoretical predictions provides insightful information, as it appears that both pairing channel are heavily suppressed in the ^{48}Cr(p,^{3}He)^{46}V reaction. This surprising vanishing is most likely explained by the level density at the Fermi surface induced by the deformation of ^{48}Cr .