EXPERIMENTAL DETERMINATION OF THE TRANSITION STRENGTH BETWEEN THE GROUND STATES OF ^{20}F AND ^{20}NE

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It is suggested that the second-forbidden, non-unique, $0^+ \rightarrow 2^+$ transition between the ground states of ^{20}Ne and ^{20}F dominates the electron-capture rate in an important temperature-density range for the final evolution of electron-degenerate ONe stellar cores in $8 - 10$ M$_\odot$ stars [1]. One can determinate the strength of the transition between ^{20}Ne and ^{20}F from the branching ratio of the inverse transition in the β-decay of ^{20}F. Only an upper limit of $< 0.001\%$ has been obtained in a previous experiment on the beta decay of ^{20}F [2]. This project aims to determine the branching ratio for the first time.

The ^{20}F activity will be produced via (d, p) reaction on a BaF_2 target at the IGISOL facility in the Accelerator Laboratory of the University of Jyväskylä. The produced ^{20}F ions will be accelerated to 30 keV and mass-separated with a dipole magnet before implantation into a thin carbon foil at the experimental setup. [3]

The experiment will be conducted with a Siegbahn-Slatis type intermediate-image magnetic electron transporter for focusing around 7 MeV electrons to a plastic scintillator to determine the ground-state to ground-state branching ratio in the beta decay of ^{20}F [4]. The plastic scintillator detector consists of two parts: the inner detector for the signal detection and the outer detector to work as a veto against cosmic rays. Inside the spectrometer there is a shield implemented with a $LaBr_3$ detector. The shield protects the plastic scintillator detector from γ-rays while the $LaBr_3$ detector measures intensity of 1.6 MeV γ-rays from ^{20}F beta decay for normalization.

In this contribution, the current status of the project will be discussed. The magnetic spectrometer, which was constructed at the University of Jyväskylä in the 1980s and originally used for in-beam conversion electron spectroscopy, has been refurbished. The full setup, including the plastic scintillator and $LaBr_3$ detector, has been tested using a ^{207}Bi source. Further characterization of the detectros continues before the online commissioning later this year.

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[2] Calaprice, *et al.*,Phys. Rev. C 17 (1978) 730-738
[3] I. Moore, *et al.*, Nucl. Instr. Meth B 317 (2013) 208
[4] R. Julin, *et al.*, Nucl. Instr. Meth 270 (1988) 74-77.