



Contribution ID: 32

Type: not specified

Gamma and particle measurement of the beta decay of ^{20}Mg

Two reactions important for the CNO cycle break-out to rapid proton capture process in type I x-ray can profit from the

measurement of beta-delayed particle emission from GS of ^{20}Mg : $^{15}\text{O}(a,g)^{19}\text{Ne}$ and $^{19}\text{Ne}(p, g)^{20}\text{Na}$.

$^{19}\text{Ne}(p, g)^{20}\text{Na}$: the resonance at $E_r = 457\text{keV}$ ($E^* = 2647\text{keV}$ in ^{20}Na) in the Gamow window is populated by beta decay of ^{20}Mg .

From previous measurements, upper limits for the population of the state were reported and a lower limit for $\log ft$ suggests that

the spin of the state has a value higher than 1.

$^{15}\text{O}(a,g)^{19}\text{Ne}$: following beta-proton decay, an excited state at 4.033 MeV in ^{19}Ne is populated. The astrophysical reaction is

dominated by a resonance at 4.03 MeV in ^{19}Ne at the temperatures of CNO-cycle break-out in type I x-ray bursts. The resonance

energy is known, but the strength is not measured. The observation in decay spectroscopy of an alpha branch from this state along

with its known lifetime would allow to determine the resonance strength.

The most recent measurements of the beta decay of ^{20}Mg were done using a cocktail of fragmented ^{24}Mg beam at NSCL and the

decaying nuclei were implanted in a thick plastic detector. The production rate of ^{20}Mg was about 5kHz, and ^{20}Mg was about 35 %

out of the implanted cocktail-beam. Only beta and gamma emissions were measured.

Using SPIRAL1 ^{20}Mg beam, DESIR purification facilities and DESIR Spectroscopy Decay station (with beta, gamma and charged

particle detection), one can provide a cleaner and more complete spectroscopy of ^{20}Mg decay.

Author: MATEA MACOVEI, Iolanda (IJCLab)