Mass measurements of high accuracy using MISTRAL spectrometer around $^{32}_{12}Mg_{20}$

The exploration of the stability valley in the isospin direction is at present time an important goal in nuclear physics. Mass measurements are very good indicators of changes in nuclear structures and put constraints, far from stability, on existing models. This work is devoted to the study of the neutron rich region around $^{32}_{12}Mg_{20}$, a very short-lived nuclide (95 ms).

MISTRAL is an on-line transmission and radiofrequency spectrometer installed at CERN in the ISOLDE hall during the summer of 1997. The mass measurement are obtained by the measurement of the cyclotron frequency of the ion turning in an homogeneous magnetic field compared to that of a reference ion. This method allows very fast and precise mass measurements (a few 10^{-7}).

Mass measurements of $^{25, 26}$Ne and ^{32}Mg have been performed in 1999. The analysis has been rendered more complex by the presence of many isobars in the radioactive beam. MISTRAL values for these three nuclides are more precise and have the bigger weight in the new evaluation. The mass of ^{32}Mg has been found to be 280 keV more bound than in the tables. The intensity of the deformation is reinforced and the shell closure at $N = 20$ seems to disappear for this nuclide.

Comparisons to classical models in nuclear physics (shell models, Mean field models, etc.) have also been studied.

Key-words : exotic nuclides, mass spectrometry, radiofrequency, accuracy, atomic masses, nuclear structure, radioactive beams.