MISTRAL : A UNIQUE PRECISION MASS SPECTROMETER FOR VERY SHORT-LIVED NUCLIDES

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The MISTRAL experiment (Mass measurements at ISOLDE/CERN with a Transmission RAdiofrequency spectrometer on Line), measures the masses from the cyclotron frequency of an ion in a homogeneous magnetic field. The great advantage of this method is its rapidity, allowing measurements of very short-lived nuclides, because the measurement duration corresponds to the time of flight of the ions through the spectrometer ($\sim 50\mu$s). This method is also capable of very high resolving power ($\frac{m}{\Delta m} \sim 10^5$) and accurate to a few 10^{-7}. The magnetic field is stable and comparisons with a reference mass are performed very frequently to eliminate fluctuations.

Several nuclides with $T_{1/2} \sim 40$ ms, in the island of inversion around $N = 20$ (neutron rich isotopes of Ne, Na, Mg) have been measured. Recently, the N=Z drip-line nuclide ^{74}Rb ($T^{1/2} \sim 65$ ms) was measured and results will be presented at this conference. This measurement will contribute to constrain the Q-value of the superallowed $0^+ - 0^+$ β-decay which is important to test the CVC hypothesis and the electroweak theory of the standard model. The new mass of ^{74}Rb also allows to assess the Wigner effect of $N = Z$ nuclei.

In order to improve the sensitivity of the apparatus and access the most exotic (i.e. shortest-lived candidates), a gas-filled radiofrequency quadrupole ion guide is being developed to reduce the injected beam emittance. First results making direct emittance measurements will be presented.

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