Abstract submitted for the
2^{nd} *International Conference on Exotic Nuclei and Atomic Masses*
Bellaire, 23-27 June 1998

MISTRAL: THE BEGINNING OF A NEW MASS MEASUREMENT PROGRAM AT ISOLDE

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The need for accurate measurements of atomic masses far from stability is acute since model predictions vary quite drastically only a few isotopes beyond known values. The modeling of the nucleosynthesis r-process, for example, not only suffers from the eventual error on the predicted mass itself, but can be biased by the propagation of uncertainty in the calculation of other nuclear physics properties that are derived from a fit to the known masses (in the case of macroscopic-microscopic models). Furthermore, the elucidation of new nuclear structure requires systematic and high precision mapping over several isotopes and isotones around a given point on the mass surface.

Given such physics motivation, a new mass measurement program has been undertaken at the ISOLDE isotope separator facility at CERN. This program, called MISTRAL* [1], complements the existing Penning trap spectrometer, ISOLTRAP [2] by concentrating on very short-lived nuclides. By two coherent, high-harmonic radiofrequency excitations of the ion orbit inside the spectrometer magnetic field, an accurate determination of its cyclotron frequency is accomplished and when compared to that of a reference ion, provides mass measurements of very high precision.

The MISTRAL spectrometer was installed in the new beamhall extension of ISOLDE in mid- 1997 and a first test run using radioactive isotopes around $A = 27$ took place at the end of that year. The spectrometer has obtained isobaric mass resolution with relatively good sensitivity and very encouraging results concerning measurement precision. The results and progress made thusfar will be presented along with the plans for this years measurement program.

* Mass measurements at ISolde using a Transmission RAdiofrequency spectrometer on-Line (CERN experiment IS-346)

1. M.D. Lunney et al., Hyperfine Interactions 99 (1996) 105; M. de Saint Simon et al., Physica Scripta T59 (1995) 406
2. G. Bollen et al., Nucl. Instr. Meth. A 368 (1996) 675; D. Beck et al., Nuclear Physics A626 (1997) 343