



A Mobile FTICR Gas Analyser with External Ion Source

Michel Héninger, Laurent Clochard, Pierre Boissel, Gérard Mauclaire, Hélène Mestdagh, Joël Lemaire

► To cite this version:

Michel Héninger, Laurent Clochard, Pierre Boissel, Gérard Mauclaire, Hélène Mestdagh, et al.. A Mobile FTICR Gas Analyser with External Ion Source. 53rd ASMS Conference, Jun 2005, San Antonio, United States. program book. hal-04216435

HAL Id: hal-04216435

<https://hal.science/hal-04216435>

Submitted on 24 Sep 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

A Mobile FTICR Gas Analyser with External Ion Source

Michel Héninger, Laurent Clochard, Pierre Boissel, Gérard Mauclair, Hélène Mestdagh, Joël Lemaire

Laboratoire de Chimie Physique, Bât. 350, Université Paris-Sud, Orsay, France

Compact FTICR

The use of a **permanent magnet** to generate a constant magnetic field in an FTICR mass spectrometer has many advantages :

- light weight, transportable
- no power supply required, no expensive cooling fluids,
- maintenance free

Magnet design

- nominal magnetic field higher than 1 Tesla
- good magnetic field homogeneity in the ICR cell volume

Our first prototype was based on a configuration where the gap between two Halbach cylinders was optimised in order to achieve a field homogeneity of 10^{-3} in the cell volume.

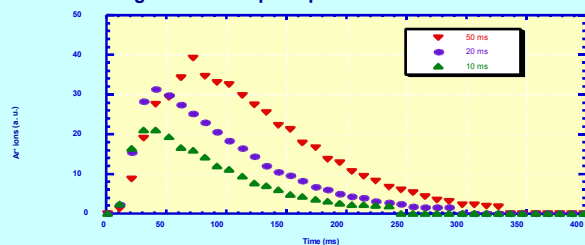
Mass resolution of 70000 @ 131 uma was obtained with this configuration.

Axial field magnet

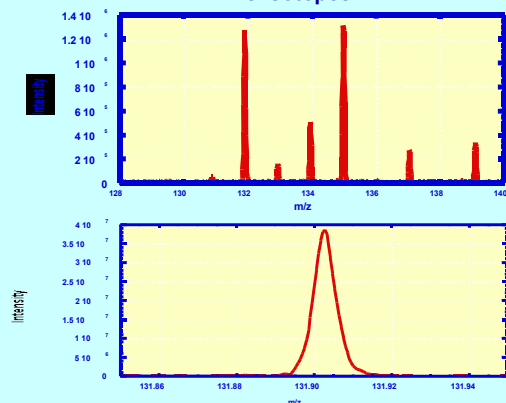
An innovative permanent magnet assembly was designed.

- The cylindrical magnet is made of several grades of rare earth **NdFeB** magnet material, that provide high coercivity and remanence. Therefore it can withstand demagnetizing fields and still generate a strong field.
- The magnetization of each part of the magnet is optimized in order to generate a resulting field that is homogeneous.
- The theoretical field profiles show a perfect **cylindrical symmetry**, so that each diameter corresponds to a constant field value. The field direction produced is parallel to the cylinder axis.
- The field strength at the cell is 1 Tesla and the field homogeneity better than 0.2% over the ICR cell volume (dia. 25x20mm).

Pulsed gas inlet : temporal profile

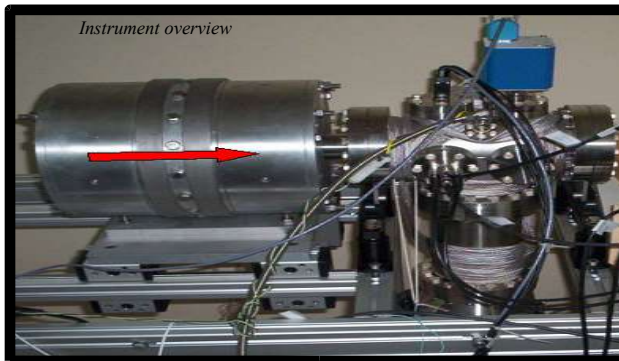


Xe isotopes



In our first test with Xenon, produced by electron impact the resolution is limited by the detection system to $m/dm=30000$

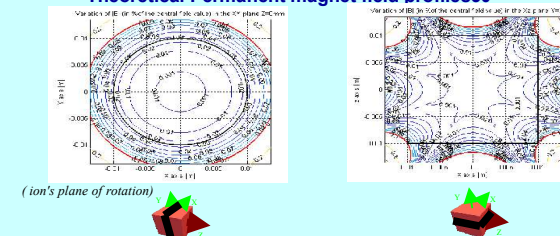
Instrument overview



The cell



Theoretical Permanent magnet field profiles

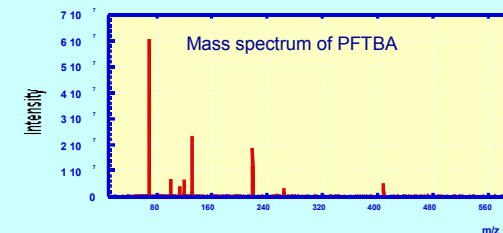


Coupling with an external ion source

In the current configuration, the ions are produced directly inside the cell by electron impact.

The combination of the axial field configuration of the magnetic design and the open cell will enable the coupling of our compact FTICR with an ion source that will be placed outside the magnet.

The transfer of the ions from the source to the ICR cell will be realized through an RF ion guide.



Aknowledgements

We are grateful to Gerard Bellec for the conception and realisation of the vacuum chamber, and Julien LeProvost for its part in the development work.

We also thank CNRS and Université Paris-Sud 11 for their financial support.

Contact : joel.lemaire@lcp.u-psud.fr, michel.heninger@lcp.u-psud.fr