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# A Mobile FTICR Gas Analyser with External Ion Source

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## 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.

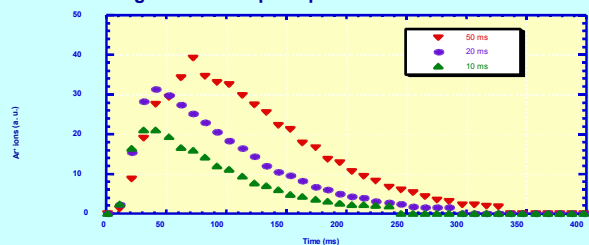
Mass resolution of 70000 @ 131 uma was obtained with this configuration.

## Axial field magnet

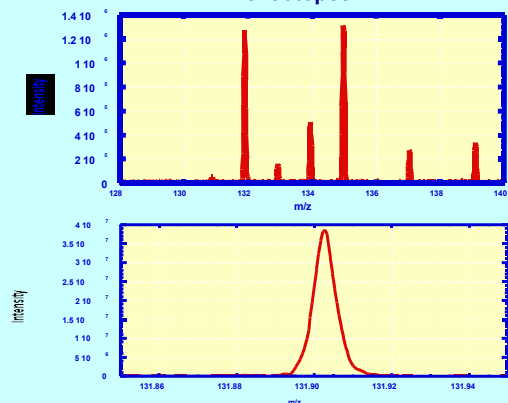
An innovative permanent magnet assembly was designed.

- 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

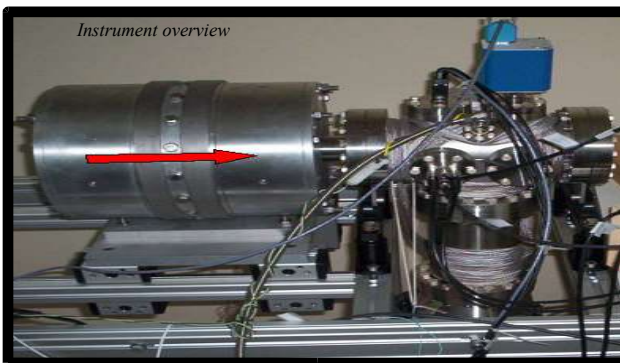


## Xe isotopes



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

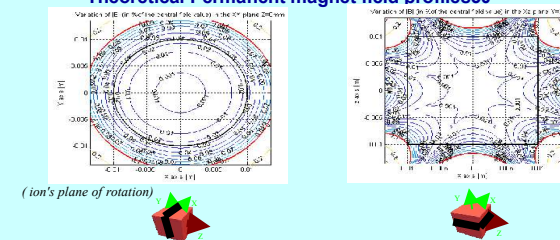
Instrument overview



The cell



## Theoretical Permanent magnet field profiles

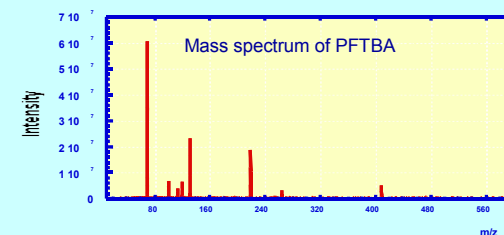


## Coupling with an external ion source

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

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