

# First Application of $\beta$ -NMR in Wet Chemistry

*Tuesday 18 December 2012 12:20 (20 minutes)*

In August 2012  $\beta$ -NMR spectroscopy was successfully applied for the world's first experiments on liquid samples - an achievement which opens new avenues of research in the fields of wet chemistry and biochemistry. This project was motivated by the need for finding a new experimental approach to directly study biologically highly relevant metal ions, such as: Mg(II), Cu(I), Ca(II), and Zn(II).

The resonance spectrum recorded for Mg-31 implanted into a liquid sample shows two clear peaks, which originate from Mg ions occupying two different coordination geometries, illustrating that this technique can in fact discriminate between different structures - the first and the most important step towards the application of  $\beta$ -NMR spectroscopy in chemistry.

A prototype bio- $\beta$ -NMR spectrometer, designed and constructed explicitly for this purpose using polarized ions at the COLLAPS setup, allowed for testing different aspects, such as: different liquids, vacua and rest gases, showing that even aqueous solutions are within reach.

In a future biochemical perspective, this proof-of-principle allows the application of  $\beta$ -NMR for studying metal ions, which are silent in most other spectroscopic techniques in their body-like environments.

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**Session Classification:** Biophysics and Medical