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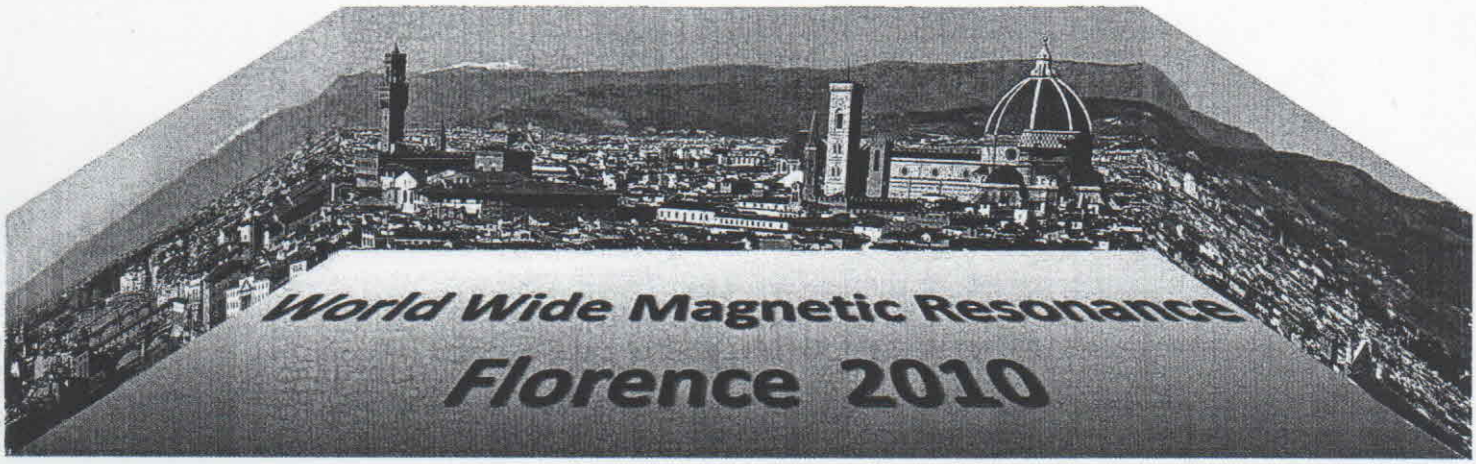

Book of Abstracts

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Design and Implementation of 2D DESIRE Experiments

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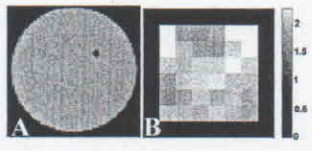
An alternative to the conventional Fourier encoding techniques is the DESIRE (Diffusion Enhancement of SIgnal and REsolution) method. This real-space method promises not only to increase the SNR but to also reveal new, diffusion-based, contrast[1,2] which will nevertheless further extend the applicability of MRM to the study of single biological cells. Images based on the DESIRE effect in one dimension have previously been obtained[3]. We present here the design and implementation of DESIRE in two dimensions and report the first 2D DESIRE image.

Conceptually, a DESIRE experiment consists of three steps. The first step is to achieve saturation in a well defined location. In order to do so we followed the "k-space" approach first proposed by Pauly[4]. We used a single shot spiral out k-space trajectory for excitation and computed RF pulses necessary to saturate the spins inside infinitely-long square prisms (100 μm side). A saturation pulse and the necessary power to obtain a 90° flip angle were computed for every saturation location. In order to correct for distortions due to off-resonance effects we incorporated a field map in the design of the RF pulses. Fig. **A** shows the saturation profile, a 100 x 100 μm^2 square cross-section prism, obtained inside a 1.8 mm radius cylinder filled with water. In step two we successively saturated 36 different locations and acquired the NMR signal. In the final step we subtracted these signals from the reference signal (same slice, no saturation) and assigned the result to the directly-saturated pixel. The 2D DESIRE image thus obtained, a 600 x 600 μm^2 square centered at the center of the sample, is shown in Fig. **B** (100 x 100 μm^2 in plane resolution, slice thickness 1mm). One possible cause for the inhomogeneity observed in the image (9.6%) can be the inhomogeneity in the B1 profile and should be eliminated by incorporating B1 field maps in the computation of the RF pulses.



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Use of Filter Diagonalization Method (FDM) to process high resolution steady state free precession (SSFP) signal with strong Fid-Echo overlap

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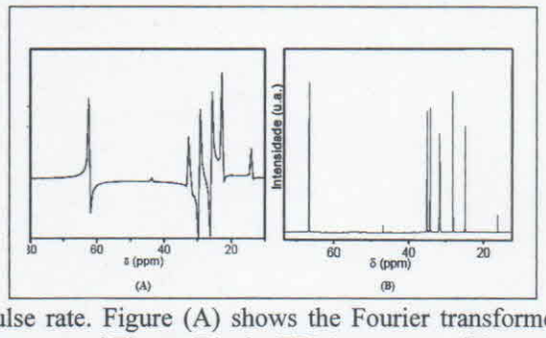
The Steady-State Free Precession (SSFP) sequence is not routinely used to enhance signal to noise ratio in high resolution NMR spectroscopy because it introduces severe spectral anomalies. These anomalies are due to the presence of an echo in the SSFP time domain signal. The Fourier transformed spectra of SSFP signals show phase distortions, truncation artifacts and poor digital resolution. FDM can deal very efficiently with truncated signals and has become a promising technique to complement the already established Fourier Transform formalism. No less important is the FDM ability of separate corrupting or uninteresting signals from complex NMR spectra, without disturbing overlapping or nearby signals. Therefore, by using the FDM it is possible to separate the overlapped FID and echo signals. In this paper we use FDM to processes ^{13}C NMR spectrum acquired with SSFP sequence with strong FID-echo overlap, with 30 ms pulse rate. Figure (A) shows the Fourier transformed spectrum of 1-octanol, obtained with SSFP sequence with 30 ms pulse rate and Figure (B), the FDM spectrum of the same NMR data. With this result we can conclude that FDM can be a powerful tool to process high resolution ^{13}C signals obtained by SSFP sequence, without phase distortions, poor digital resolution and truncation artifacts as observed in figure 1A.



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