Figure 5.1 (a) The magnetic dipolar field $B_z$ at point P of a sample induced by a magnetic moment $m$ under the external magnetic field $B_0$. $\delta$ is the angle between $B_0$ and the dipolar vector $D_R$, which depends on a distance $R$ from $m$. (b) The MAS effect on the dipolar interaction, where $\delta$ becomes a time-dependent component with magic-angle $\theta_m$ and $\beta$ angle between the rotation axis and $D_R$ [eqn (5.4)].

$$B_z = -\frac{\Delta \chi a^3}{3 R^3} B_0 \left( 3 \cos^2 \delta - 1 \right)$$
Figure 1. Schematic of a HR-MAS stator with a magic angle gradient along the rotor spinning axis.
Figure 4. The tools and inserts used for HR-MAS NMR. These include A) the specialized tool for screw cap insertion, B) the sealing screw cap, C) the upper Teflon® insert, D) lower Teflon® insert for 30 µL volume, E) screw for insertion/extraction of top insert, F) top Kel-F® insert, G) bottom Kel-F® insert for 12 µL sample volume, H) plug for disposable insert, I) disposable 30 uL Kel-F® insert, J) 4 mm rotor cap, K) disposable inserted partially in a 4 mm rotor, L) 4 mm zirconia MAS rotor. All these parts are for the Bruker HR-MAS system, and may vary between vendors.
Figure 2. The improved resolution observed using $^1$H HR-MAS NMR for the A) methanol swollen anion exchange membrane, and B) the CDC$_3$ swollen pBAN (polyButadiene-AcryloNitrile) polymer.
Figure 1.1 $^1$H NMR spectra of $\mathcal{L}$-histidine·HCl·H$_2$O under ultrafast MAS at a magnetic field $B_0 = 14.1$ T.
Figure 3. The gradient 2D $^1$H HR-MAS NMR COSY spectrum for the ionic liquid [MBPyrr]·[TFSI]- adsorbed into an inorganic aluminum oxide membrane. Even though the individual couplings were not resolvable, these types of correlation experiments can still be realized under HR-MAS.
Figure 5.2 $^1$H HR-MAS spectra of 10 mg rat brain tissue. The NMR spectra were recorded with a $t_2$-cpmg experiment at 500 MHz at 285 K under different MAS conditions: (top) under a non-sample-spinning condition at 0 Hz, and (bottom) at a sample-spinning of 2500 Hz. The tissue was packed inside a standard Bruker disposable Kel-F insert, which is used to enhance the sampling throughput and spectral repeatability.
a) HR-MACS μcoil
(sample-mass 250 μg)

b) 1 mm HRμMAS probe
(sample-mass 490 μg)

- chicken liver
- pig liver
- mouse brain biopsy
- mouse brain extract

'H chemical shift / ppm
Figure 2  HR-MAS $^1$H-$^{13}$C gHSQC 2D NMR spectrum of olive leaves of Koroneiki variety. Numbers correspond to oleanolic acid protons, while f denotes fatty acid signals.
Figure 3  Expansions of the $^1H$ HR-MAS NMR spectrum of olive leaves: vinyl proton H-12 (top left), methyl group H-27(top right), hydroxyl region (bottom).
400 MHz HR MAS $^1$H NMR spectra of persimmon during the process of development (from September (S) to March (M)).
Figure 2. 1H HRMAS NMR spectrums of Parmigiano Reggiano cheese [12]