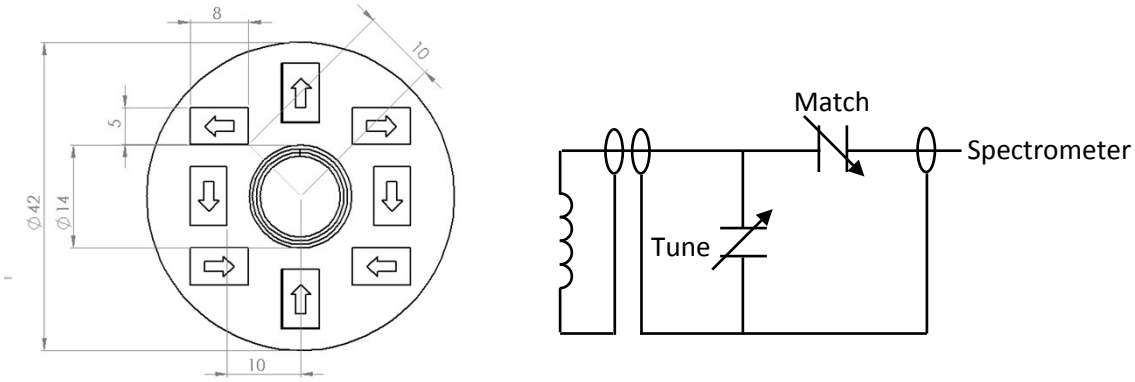
Electronic Supplementary Material (ESI) for Analytical Methods.

Supplementary Material



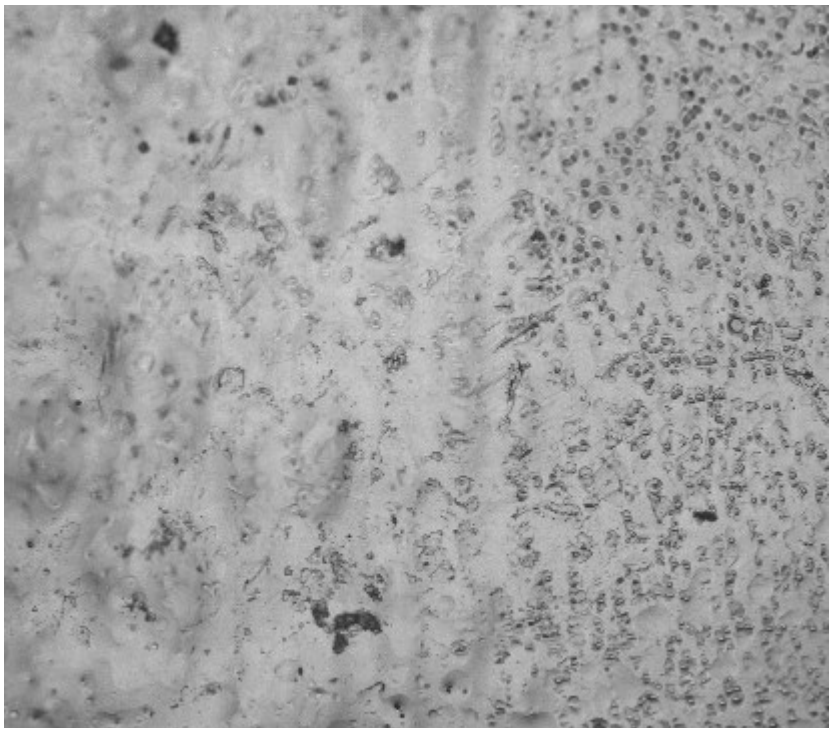
S1. Left – Schematic showing arrangement of 8 N42 Neodymium Iron Boron Magnets (first4magnets ltd., Uk) with dimensions (8x5x130)mm in their acrylic housing. Arrows point at north from south. An RF coil comprising 20 close packed turns of 1mm o.d. enamelled copper wire (Rowan Cable Products ltd. UK) with a 13mm o.d. is centralised in the bore. Right - Impedance matching at the proton Larmor frequency is achieved with 2 10-48pF variable ceramic capacitors (Sprague Goodman Electronics, USA). This ensures delivery of the maximum RF power to the coil which is connected to the two capacitors via a BNC connector.

S2. A photograph of a test stick partially inserted into the probe (which connects to the tuning and matching circuit of S1 by the coaxial cable and BNC connector bottom left.

S3. Sample Preparation

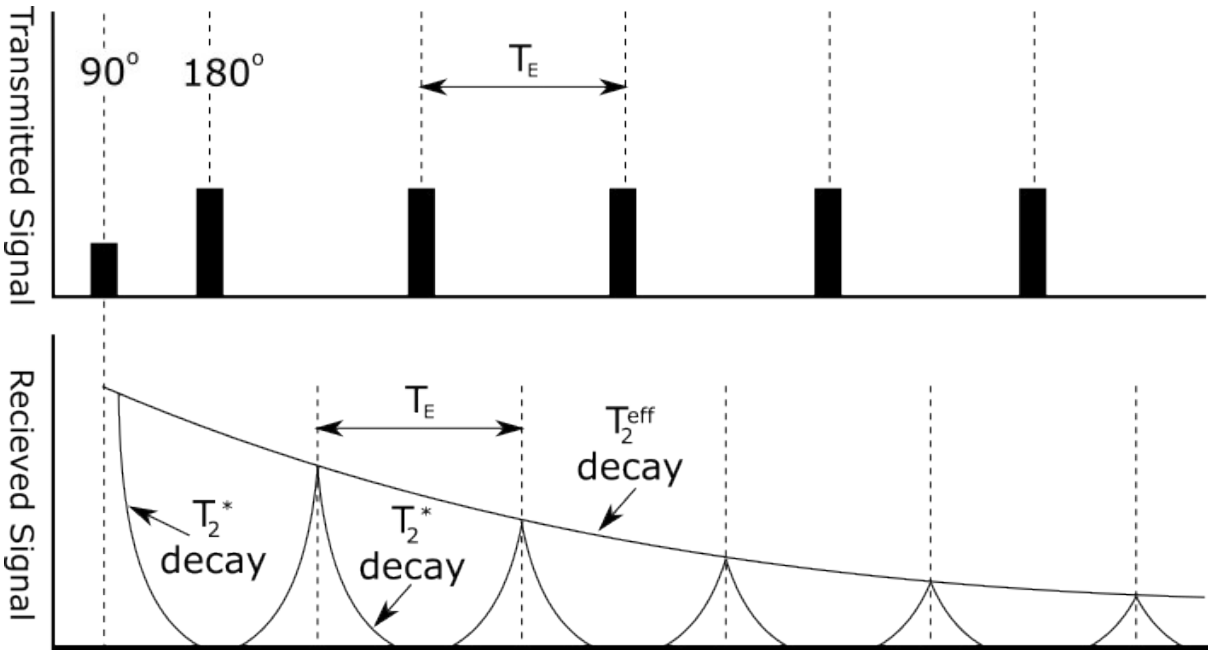
Biotin coated polystyrene well plates (Pierce™, Fisher, UK) were laser cut to fit in the indentation in the acrylic test sticks. Avidin coated MNPs (BNF-starch-redF 100nm, Micromod Partikeltechnologie GmbH, Germany) were purchased in a suspension of

PBS to a concentration of 0.5% w/v which provided an appropriate concentration for binding to the immobilised biotin. 20μL of this solution was placed into each indentation within the test sticks and incubated at room temperature for 30 minutes before washing again in the solution of PBS to remove excess unbound MNP before the sticks were air dried for 8 hours.



S4. Bright field confocal microscope image demonstrating higher binding concentration on non-rastered (right) side.

S5. The Carr Purcell Meiboom Gill (CPMG) pulse sequence was used in this work. This sequence allows the collection of signal in inhomogeneous fields where the T_2^* characteristic time of a free induction decay following a 90^o pulse is too short to be captured (owing to the dead time of the probe). The application of a 180^o pulse a time τ after the 90 will generate an echo of the original signal a time τ later. This process can be repeated a number of times with the application of 180^o pulses separated by $TE=2\tau$. Each of the subsequent echoes will be at a lower value than that which preceded it. The envelope of these echoes is another exponential decay function, with characteristic time constant T_2^{eff}. A diagram



S6. Diagram of the CPMG pulse sequence used in this work.