Supplementary Information for

Interfacing Digital Microfluidics with High-Field Nuclear Magnetic Resonance Spectroscopy

Ian Swyer,[1*] Ronald Soong,[2*] Michael D.M. Dryden,[1] Michael Fey[3], Werner E. Maas[3], André Simpson,[2†] Aaron R. Wheeler[1,4,5†]

[1] Department of Chemistry, University of Toronto, 80 St. George St., Toronto, ON, M5S 3H6

[2] Department of Chemistry, University of Toronto Scarborough, 1256 Military Trail, Toronto, ON, M1C 1A4

[3] Bruker BioSpin Corp., 15 Fortune Drive, Billerica, Massachusetts, USA, 01821—3991

[4] Donnelly Centre for Cellular and Biomolecular Research, University of Toronto, 160 College St., Toronto, ON, M5S 3E1

[5] Institute for Biomaterials and Biomedical Engineering, University of Toronto, 164 College St., Toronto, ON, M5S 3G9

* These authors contributed equally

†Corresponding Authors

A.S
email: andre.simpson@utoronto.ca
tel: +1 (416) 287 7547
fax: +1 (416) 287 7279

A.R.W
email: aaron.wheeler@utoronto.ca
tel: +1 (416) 946 3864
fax: +1 (416) 946 3865

The planar microcoils used here were fabricated using multi-layer technology and optimized for RF performance. The base material and photoresist coating were chosen to reduce material losses of the RF signal. The photoresist also allows for the use of high-aspect-ratio copper in the coil, which facilitates a large surface area in the limited (planar) space above it for detection.

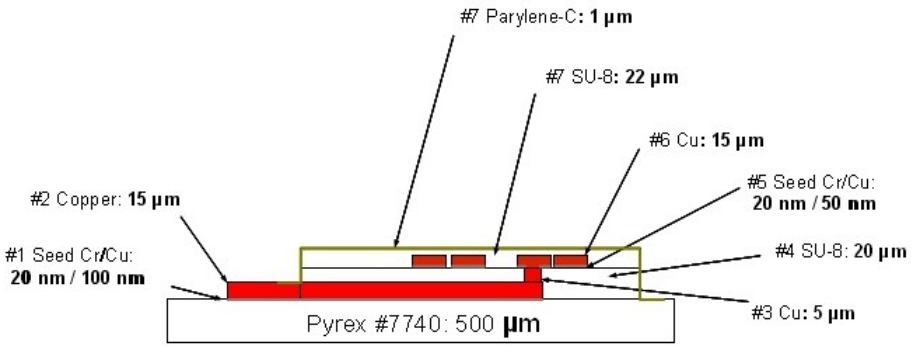

Figure S1: Side-view schematic of microcoil. The completed device is formed from seven layers with multiple fabrication steps required for each layer. To increase inductance, multiple turns are used, which required means to form an electrical a cross-over with reasonable size and stability.

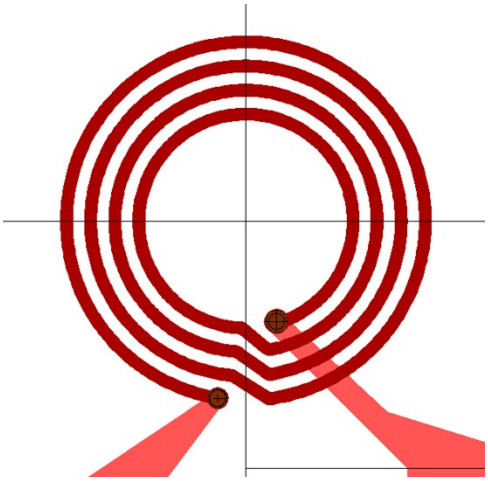

Figure S2: Top-view schematic of microcoil. The inner diameter is 500 µm, the outer diameter is 920 µm, the wire width and the gap between wires is 30 µm.

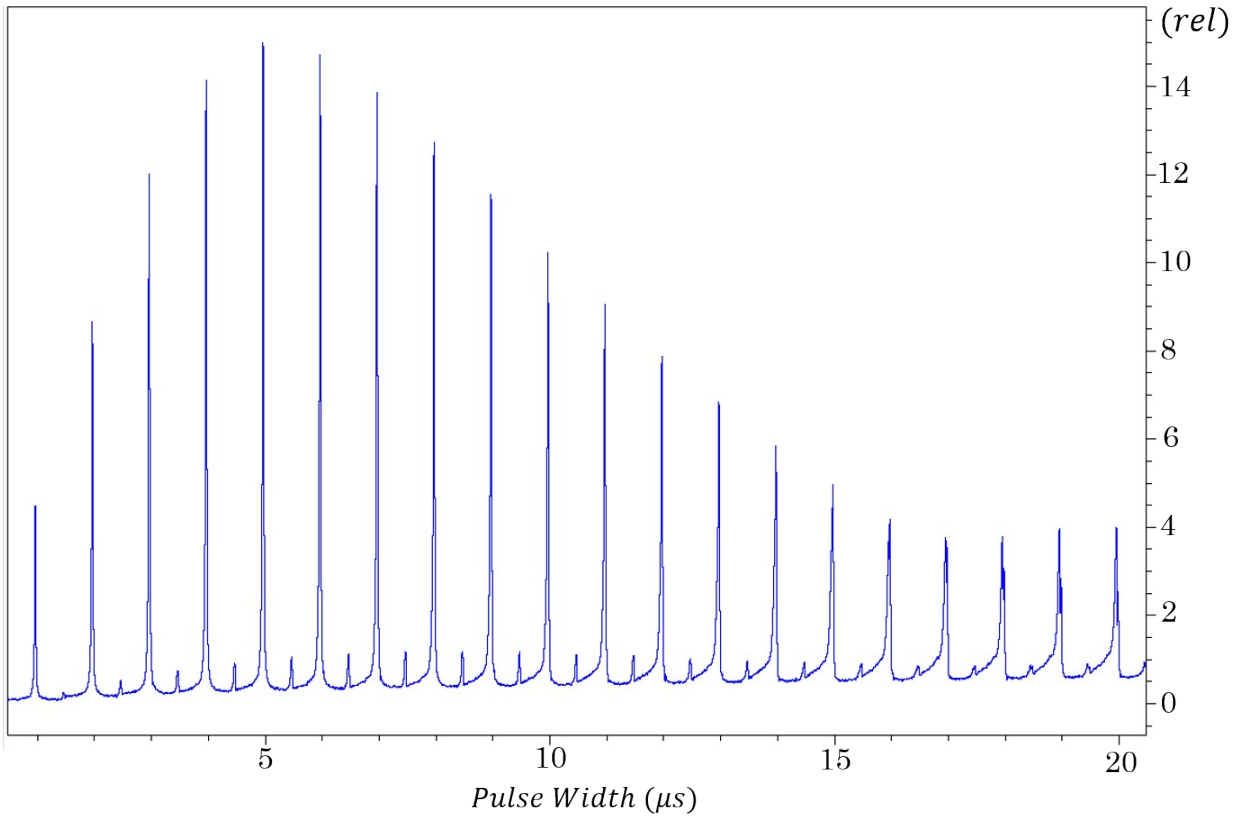

Figure S3: Nutation curve for water from 0-20 μs for the microcoil used in this study (collected at 0.1 W). While it is useful in determining the correct 90° pulse for the coil, the curve never reaches a true 180° null or leads to peak inversion beyond 180°. This is expected and well documented for single-sided surface coils (Ehrmann and Gersbach, *J. Mag. Res.*, 2006, *178*, 96-105). This is a considerable drawback of a single-sided planar coil design, limiting the range of NMR experiments that can be performed. While Figure 4 in the main text illustrates a ^{1}H-^{1}H TOCSY data set collected on this coil, it should be pointed out that the TOCSY spin-lock is relatively forgiving in terms of RF homogeneity. More elaborate experiments that rely on inversion and cancelation of signals or accurately shaped pulses will suffer in performance because of the poor B_1 field homogeneity afforded by a single-sided surface coil. In future experiments, the coils will be redesigned to improve the B_1 field homogeneity (for example a Helmholtz configuration with using 2 coils on either side of the droplet) to permit a wider range of NMR experiments to be performed.