

## MRS Protocols (GE Signa Premier, MR30.1)

|                           | Associated Sequences                                                 |                                                |                                                                                 |                                                                                 |
|---------------------------|----------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| <b>T1 Structural</b>      | T1 MPAGE, 1mm isotropic, ~5:50                                       |                                                |                                                                                 |                                                                                 |
| <b>MRS Localizer</b>      | 2D T1FLAIR axial-oblique, ~1:10<br>2D T1FLAIR coronal-oblique, ~1:10 |                                                |                                                                                 |                                                                                 |
|                           | MRS Single-Voxel                                                     |                                                |                                                                                 |                                                                                 |
|                           | PRESS                                                                | sLASER                                         | MEGA-PRESS                                                                      | MEGA-sLASER                                                                     |
| <b>Water Suppression</b>  | CHESS                                                                | VAPOR                                          | CHESS                                                                           | VAPOR                                                                           |
| <b>VAPOR Flip Angle</b>   | -                                                                    | 65                                             | -                                                                               | 80                                                                              |
| <b>Data Point Size</b>    | 4-byte (32-bit, EDR)                                                 | 4-byte (32-bit, EDR)                           | 4-byte (32-bit, EDR)                                                            | 4-byte (32-bit, EDR)                                                            |
| <b>Spec Width (Hz)</b>    | 2000 (5000 by default)                                               | 2000 (5000 by default)                         | 2000 (5000 by default)                                                          | 2000 (5000 by default)                                                          |
| <b># of Data Points</b>   | 2048 (4096 by default)                                               | 2048 (4096 by default)                         | 2048 (4096 by default)                                                          | 2048 (4096 by default)                                                          |
| <b>TE (ms)</b>            | 35 (general, NAA/Cr/Glx)<br>144 (lactate), ...                       | 35 (general, NAA/Cr/Glx)<br>144 (lactate), ... | 68 (GABA)                                                                       | 74 (GABA, GE version)                                                           |
| <b>TR (ms)</b>            | 2000 (min. 1500)                                                     | 2000 (min. 1800)                               | 2000                                                                            | 2000                                                                            |
| <b>Editing Pulses</b>     | -                                                                    | -                                              | GABA (GE version):<br>ON freq -356 Hz<br>OFF freq 356 Hz<br>Pulse duration 15ms | GABA (GE version):<br>ON freq -356 Hz<br>OFF freq 356 Hz<br>Pulse duration 16ms |
| <b>NEX (Phase Cycles)</b> | 8                                                                    | 8                                              | 8                                                                               | 8                                                                               |
| <b>Voxel Size (mm)</b>    | 20x20x20 (example)                                                   | 20x20x20 (example)                             | 20x20x20 (example)                                                              | 20x20x20 (example)                                                              |
| <b># of Acqs</b>          | 160-320<br>Depending on SNR (voxel size)                             | 160-320<br>Depending on SNR (voxel size)       | 320 (160 On, 160 Off)                                                           | 320 (160 On, 160 Off)                                                           |
| <b>Scan Time</b>          |                                                                      |                                                | ~ 11 min                                                                        | ~ 11 min                                                                        |
| <b>Notes</b>              |                                                                      |                                                | Same as in 'Big GABA'                                                           |                                                                                 |

## DTI/DWI/dMRI Protocols (GE Signa Premier, MR30.1)

|                                              | Associated Sequences                                                           |                                                    |                                                                  |
|----------------------------------------------|--------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------|
| <b>T1 Structural</b>                         | T1 MPAGE, 1mm isotropic ~5:50                                                  | T1 MPAGE, 1mm isotropic ~5:50                      | T1 MPAGE, 1mm isotropic ~5:50                                    |
| <b>Distortion Correction / Field Mapping</b> | TOPUP AP/PA, 1.7mm isotropic ~0:50                                             | TOPUP AP/PA, 2mm isotropic ~0:50                   | TOPUP AP/PA, 2mm isotropic ~0:50                                 |
|                                              | <b>dMRI (Multi-shell Multi-band)</b>                                           |                                                    |                                                                  |
|                                              | <b>ABCD</b>                                                                    | <b>UK BioBank</b>                                  | <b>ADNI3 Adv</b>                                                 |
| <b>FOV / Matrix Size</b>                     | 24.0 cm / 140x140                                                              | 20.8 cm / 104x104                                  | 23.2 cm / 116x116                                                |
| <b>Slice Thickness / # of Slices</b>         | 1.7 mm / 81 sl.                                                                | 2 mm / 72 sl.                                      | 2 mm / 81 sl.                                                    |
| <b>TR/TE (ms)</b>                            | 4500/Min                                                                       | 3300/Min                                           | 3300/Min                                                         |
| <b>MUX / ARC</b>                             | MUX=3, ARC=1                                                                   | MUX=3, ARC=1                                       | MUX=3, ARC=2                                                     |
| <b>Phase-Encoding Dir</b>                    | PA                                                                             | PA                                                 | PA                                                               |
| <b>T2 Baseline (b=0)</b>                     | 2 with 6 b=0 in tensor file                                                    | 1 with 4 b=0 in tensor file                        | 1 with 12 b=0 in tensor file                                     |
| <b># of Diff Grad Dirs</b>                   | 102                                                                            | 104                                                | 126                                                              |
| <b>b-values</b>                              | (tensor4321.dat)<br>6 b=0<br>6 b=500,<br>15 b=1000,<br>15 b=2000,<br>60 b=3000 | (tensor521.dat)<br>4 b=0<br>50 b=1000<br>50 b=2000 | (tensor1127.dat)<br>12 b=0<br>6 b=500,<br>48 b=1000<br>60 b=2000 |
| <b>Gradient-Cycling</b>                      | OFF                                                                            | OFF                                                | OFF                                                              |
| <b>Scan Time</b>                             | 7:53 min                                                                       | 5:50 min                                           | 7:03 min                                                         |

### fMRI Protocols (GE Signa Premier, MR30.1)

| ABCD                                                                                          | ABCD MUX4                                                                                                | HCP                                                                           | Single-Band EPI                                                             | Multi-Echo fMRI                                                                                    |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| T1: MPRAGE<br>1mm isotropic<br>~5:50                                                          | T1: MPRAGE<br>1mm isotropic<br>~5:50                                                                     | T1: MPRAGE<br>0.8mm isotropic<br>~6:38 (x2)                                   | T1: BRAVO/MPRAGE<br>1mm isotropic<br>~4:00 (BRAVO)<br>~5:50 (MPRAGE)        | (From ABCD)<br>T1: MPRAGE<br>1mm isotropic<br>~5:50                                                |
| T2: CUBE PROMO<br>1mm isotropic<br>~6:00                                                      | T2: CUBE PROMO<br>1mm isotropic<br>~6:00                                                                 | T2: CUBE PROMO<br>0.8mm isotropic<br>~5:18                                    | T2: CUBE PROMO<br>1mm isotropic<br>~6:00                                    | T2: CUBE PROMO<br>1mm isotropic<br>~6:00                                                           |
| Distortion Correction<br>TOPUP AP/PA<br>~0:30                                                 | Distortion Correction<br>TOPUP AP/PA<br>~0:30                                                            | Distortion Correction<br>TOPUP AP/PA<br>~0:30                                 | Distortion Correction<br>B0 Map<br>~1:00                                    | Distortion Correction<br>TOPUP AP/PA<br>~0:30                                                      |
| fMRI: MUX6 2.4mm<br>ARC=1 TR/TE=800/30ms<br>FOV 216 Matrix 90x90<br>60 slices                 | fMRI: MUX4 2.4mm<br>ARC=2 TR/TE=900/26ms<br>FOV 216 Matrix 90x90<br>60 slices                            | fMRI: MUX6 2mm<br>ARC=1 TR/TE=900/26ms<br>FOV 216 Matrix 108x108<br>66 slices | fMRI: EPI 3mm<br>ASSET=2 TR/TE=2s/25ms<br>FOV 192 Matrix 64x64<br>45 slices | fMRI: MUX4 2.4mm<br>ARC=2 TR=1.8s<br>3 TEs (16.4/42.0/67.5ms)<br>FOV 202 Matrix 84x84<br>60 slices |
| Replicates ABCD Study<br>parameters <a href="https://abcdstudy.org">https://abcdstudy.org</a> | Replicates ABCD Study<br>parameters w/improved<br>coverage of orbitofrontal and<br>ventrotemporal cortex | HCP-like, higher resolution                                                   | Single Band EPI                                                             | Multi-Echo Multiband fMRI                                                                          |