**SimNIBS coil models according to**

**Deng ZD, Lisanby SH, Peterchev AV.**

**Electric field depth-focality tradeoff in transcranial magnetic stimulation: simulation comparison of 50 coil designs.**

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The SimNIBS coil models were created by importing the CAD files supplied by Zhi-De Deng into Comsol, which was then used to simulate the magnetic vector potential. Alternatively, some of them were created directly in Comsol using the information about the winding geometry stated in the supplementary material from the paper published by Zhi-De Deng (Brain Stim 2013) (indicated by the Comment “own drawing” in the following table). The workflow to create the SimNIBS coil models is briefly summarized in the following flow chart:

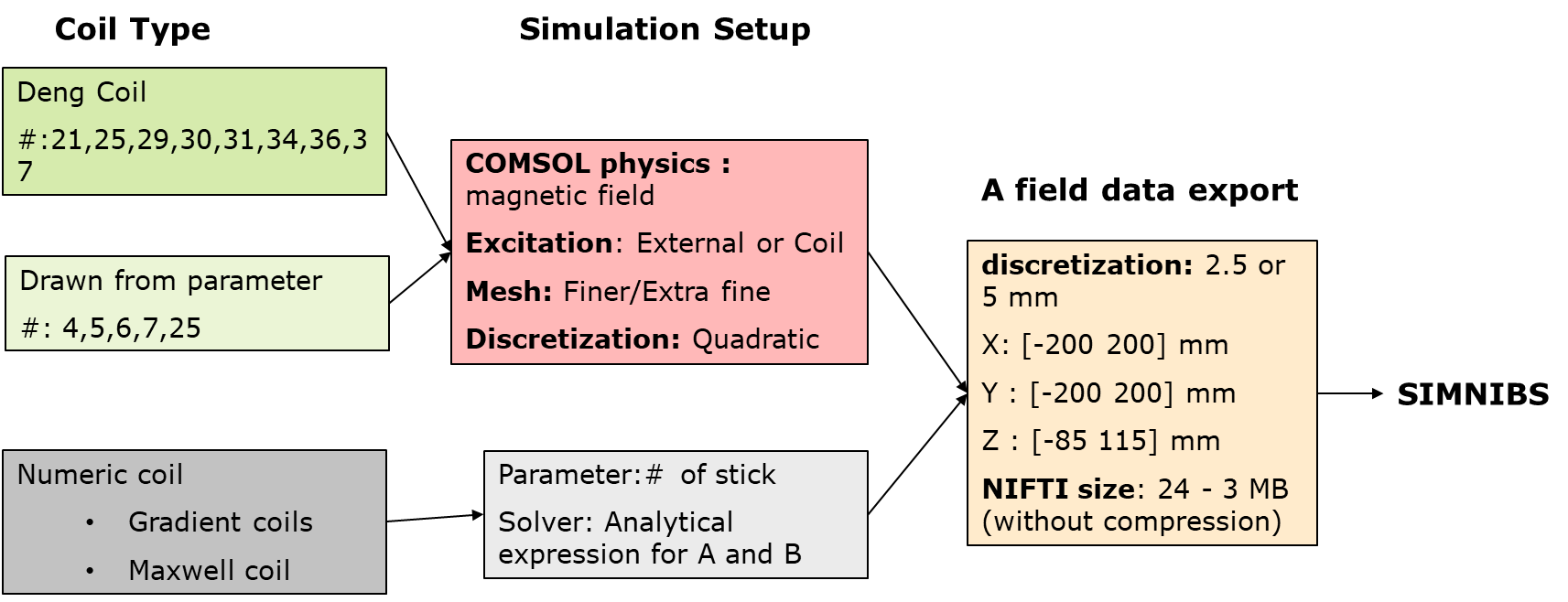


Table: This table was adapted from the table in the suppl. material from Deng (Brain Stim 2013) to show the coils which have been converted to SimNIBS:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Coil  # | Coil model/  Manufacturer, Parameter | Simulation  configuration | Electric field  distribution† |  | Emax  [V/m] | [cm] | [cm2] | Comment | Ref |
| 4 | 70 mm circular  (P/N 9762)/Magstim,  Flat spiral winding  OD = 94 mm  ID = 40 mm  WC = 1.75 mm × 6 mm  N = 15 turns |  |  |  | 2.72 | 1.44 | 66.0 | Own Drawing | 2 |
| 5 | Flat spiral winding  OD = 123 mm  ID = 66 mm  WC = 1.75 mm × 6 mm  N = 14 turns |  |  |  | 2.74 | 1.74 | 87.4 | Own Drawing | 2 |
| 6 | MST animal  circular/ Magstim,  Double layer flat spiral winding  OD = 97.5 mm  ID = 47 mm  WC = 1.75 mm × 6 mm  N = 9 turns/layer×2 layers = 18 turns |  |  |  | 2.89 | 1.53 | 72.7 | Own Drawing | — |
| 7 | MST human circular  (S/N MP39)/ Magstim, Double layer flat spiral winding  OD = 120 mm  ID = 44 mm  WC = 1.75 mm × 6 mm  N = 9 turns/layer×2 layers = 18 turns |  |  |  | 2.81 | 1.72 | 86.4 | Own Drawing | — |
| 9 | H1/  Brainsway,  Wire segments 4–12 cm in length  WC = 1 mm × 1 mm |  |  |  | 2.54 | 2.14 | 113 | Redrawn from CAD. Electric current is employed instead of Coil Physic | 5-10 |
| 20 | MRI z-gradient coil  parallel-current (Helmholz) mode,  Coil diameter = 0.7 m  Coil length = 0.8 m |  |  |  | 0.043 | 3.49 | 273 | Implemented as  Numerical Coil | 16 |
| 21 | 3-layer double coil/ experimental Stacked flat spiral winding  OD = 30 mm  ID = 8 mm  WC = 0.7 mm × 7.1 mm (stranded)  N = 13 turns/layer × 3 layers × 2 wings = 78 turns |  |  |  | 2.75 | 0.87 | 5.07 | 2.5 mm discretization for A field. |  |
| 25 | 25 mmfigure-8 (P/N 1165)/  Magstim, Flat spiral winding  OD = 42 mm  ID = 18 mm  WC = 0.75 mm × 6 mm  N = 14 turns/wing × 2 wings |  |  |  | 2.88 | 0.96 | 6.46 | Own Drawing | 2,23 |
| 29 | C-B60 butterfly/ MagVenture,  Flat spiral winding  OD = 75 mm  ID = 35 mm  WC = 1.75 mm × 11 mm (stranded)  N = 5 turns/wing × 2 wings × 2 layers |  |  |  | 2.13 | 1.33 | 12.9 | From available CAD | 26 |
| 30 | MC-B70 butterfly/MagVenture  Bent spiral winding  OD = 108 mm  ID = 24 mm  WC = 3.5 mm × 6 mm (stranded)  N = 10 turns/wing × 2 wings |  |  |  | 2.82 | 1.35 | 13.9 | From available CAD | 26-28 |
| 31 | 70 mm figure-8 (P/N 9925, 3190)/  Magstim, Flat spiral winding  OD = 87 mm  ID = 56 mm  WC = 1.75 mm × 6 mm  N = 9 turns/wing × 2 wings |  |  |  | 3.02 | 1.41 | 14.8 | From available CAD | 2,23,27 |
| 34,  34\* | Iron-core figure-8/ Neuronetics,  Core OD = 30.6 mm  Core ID = 116 mm  Wire wrapped around  cross-section of the core  N = 5 turns/wing (stranded) |  |  |  | 4.91 | 1.49,  1.33\* | 17.3,  12.9\* | From available CAD | 31,32 |
| 36 | Twin coil/ MagVenture,  Stepped spiral winding  OD = 119 mm  ID = 40 mm  H = 30 mm  N = 15 turns/wing  WC = 15 mm × 2.5 mm (stranded)  Opening angle from origin = 100º |  |  |  | 3.65 | 2.49 | 78.3 | From available CAD | — |
| 37 | Double cone (P/N 9902)/ Magstim,  Stepped spiral winding  OD = 125 mm  ID = 96 mm  N = 7 turns/wing  WC = 1.75 mm × 6 mm  100º between the wings |  |  |  | 4.20 | 1.98 | 34.0 | From available CAD | 2 |
| 49 | MRI z-gradient coil opposing-current (Maxwell) mode  See #20 for coil dimension |  |  |  | 0.008 | 2.07 | 240 | Implemented as  Numerical Coil | 16 |
| 50 | MRI x- (or y-) gradient (Golay) coil,  Coil diameter = 0.7 m  Coil length = 0.8 m |  |  |  | 0.015 | 2.02 | 158 | Implemented as  Numerical Coil, separation is 0.1 m  Theta: pi/3 | 40 |

† Electric field magnitude on brain surface plotted with color map normalized to field maximum (red). Arrows indicate field direction.

†† “Same current direction” means that the current direction is clockwise in all loops or is counterclockwise in all loops

Repeating the FEM simulation in SimNIBS for a spherical head model with identical properties as those used in Deng (Brain Stim 2013) shows a reasonable match between the focality and depth values reported in the original paper:

|  |  |
| --- | --- |
|  |  |

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