Phantom protocol for AIDAqc

version 20250505

1. What kind of phantoms?

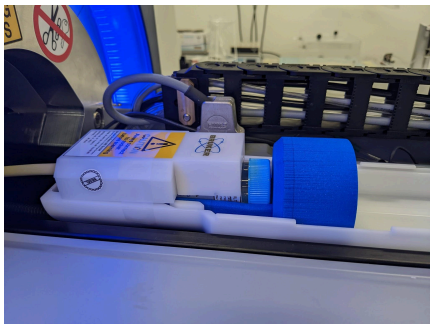
For mouse coil - 15ml falcon tube identified as MRI PHAN 1H IM M. HEAD, typically delivered with Bruker scanner. The phantom content is an aqueous solution of 1g/l $CuSO_4*5H_2O$ and 4.31g/l NaCl

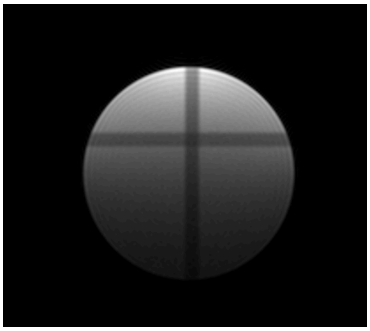
For rat coil - 50ml falcon tube identified as MRI PHAN 1H IM R. HEAD. The phantom content is an aqueous solution of 1g/l $CuSO_4*5H_2O$ and 3.6g/l NaCl

Both consist of demineralized water, sulfuric acid copper and sodium chloride. The filling is appropriate for 1H NMR in the frequency range of 200-400 MHz

2. How should it be positioned?

The phantom should be attached to the surface coil, straight, with no air bubbles. When acquiring the localizer scan make sure the phantom is in the isocenter.





3. How many timepoints?

For our first proof of concept study we acquired three sequences per phantom at weekly intervals for twelve weeks (Kalantari, EMIM2023 #901). For this study we ask you to collect at least four timepoints at weekly intervals, possibly with six-seven days in between scans. Please do not skip timepoints.

4. What sequences?

a. For equilibration purposes keep the time from phantom positioning inside the scanner and start of the acquisition constant
b. Perform tuning and matching of your coil
c. Write down the reference power of the coil for each session in the Excel sheet
d. To optimize static magnetic field (B0) inhomogeneities global 1st order shimming followed by fieldmap-based local shimming should be performed (FOV mouse phantom 25.6*25.6, rat phantom 40 x 40)
e. For the GE-EPI (single shot FID EPI, T2* contrast) acquisition with multiple repetitions. **Drift compensation, Fat suppresion** and **AutoGhost** should be **ticked on**. Set bandwith 300 kHz.

f. For T1 and T2 use fast spin echo with RARE factor = 8, **fat suppresion** ticked on.
g. Acquire one or more of the following sequences:

Mouse (MRI PHAN 1H IM M. HEAD) use the 15ml phantom

- T1 RARE TE/TR=12ms/700ms, NA=3, image size 192*192, FOV 20*20, res 104µm2
- T2 turboRARE TE/TR=60/2000ms, NA=8, image size 192*192, FOV 20*20, res 104µm2
- GE-EPI TE/TR=12ms/1000ms, Rep=600, image size 64*64, FOV 25.6*25.6, res 400µm2

Rat (MRI PHAN 1H IM R. HEAD)use the 50ml phantom

- T1 RARE TE/TR=12ms/700ms, NA=3, image size 192*192, FOV 35*35, res 182µm2
- T2 turboRARE TE/TR=64/2000ms, NA=8, image size 256*256, FOV 35*35, res 137µm2
- GE-EPI TE/TR=12ms/1000ms, Rep=600, image size 64*64, FOV 40*40, res 625µm2

Geometry:

T1/T2 => 9 slices, 0.8 mm with 0.30 mm slice gap
EPI => 5 slices, 1 mm with 0.25 mm slice gap

This set of sequences have been acquired at a 3T biospec Bruker scanner, in your specific case just drag and drop the default T1 RARE/T2 turboRARE/GE-EPI for your coil combination and your field strength and modify the parameters accordingly.

If you cannot use this set of sequences or only with adjusted parameters, specify here:

AIDAqc_phantom excel file