

Phantom is constructed using 17.5 cm diameter spherical container from Dielectric. Relaxation agent recipe (Schneiders [1]) to provide T1 and T2 comparable to gray matter. A small amount of NaCl is added to increase the conductivity to mimic the RF load of a head.

1. Make 21.8 mM NiCl₂ mixture: 2.82 grams Nickel Chloride per 1 L H₂O

2. Make agar mixture:

3600 ml H₂O

400 ml 21.8 mM NiCl₂

120 grams Agar

20 grams NaCl (0.5%)

1 gram of Sodium Azide (toxic, used to retard growth of mold)

3. Use two 2L glass beakers, dividing the mixture into halves.

Boil each liter of mixture **slowly** as follows:

Heat beakers one at a time for 3-5 minutes at high power in microwave.

Ours is listed as 750 watt; times may (or may not) scale with power.

Remove beaker and stir well between periods in microwave.

Put other beaker in oven, swapping back and forth.

Interleave the beakers through the heat/stir cycles unless the microwave is large enough for both at once.

Observe to ensure that it doesn't boil over and titrate time accordingly, reducing the cycle time as the temp rises.

Do not use heating plate to heat beakers to avoid baking/burning the gel.

Repeat heat/stir cycles until the agar is **completely** dissolved

Liquid should be light brown but clear.

This entire process will take about 1-2 hours of heating.

Immediately pour hot liquid into phantom using funnel while boiling hot.

If liquid is allowed to cool, it will gel and cannot be used

4. After final pour, purge all air bubbles using a 60cc syringe filled with liquid and connected to tubing inserted to bottom of phantom, filling sphere until liquid runs out hole. Doing this will waste a lot of goo, so be prepared to catch the spillover. Plug hole with nylon screw and o-ring gasket while liquid is still hot.

Note that the starting volume of the mixture is greater than $\frac{4}{3}\pi r^3 = 2800$ ml. Reduction occurs by boiling of water, spillover or by magic; however, there will be at least 500 ml left over.

Courtesy Anne Marie Sawyer-Glover.

1. Schneiders NJ. Solutions of two paramagnetic ions for use in nuclear magnetic resonance phantoms. Med. Phys. 15, 12-16 (1988).