

IX. Proton Gradient Shimming

Automatic shimming can be done using proton gradient shimming on 90% water samples. Samples that are fully deuterated *will not work in the BSBE lab*. Saving shims before starting this routine is recommended. Gradient shimming will shim only the Z shims. X and Y shims must be done separately, usually before starting the gradient shimming routine.

1. Collect a 1-D spectrum, adjust shims manually *before* gradient shimming, calibrate the pulse width and set **pw90**, move the **tof** onto the water peak. Set the **gain=0**.
2. To get to the menu for gradient shimming:
>**gmapsys**
3. **gsize** sets which Z shims to use. For example, **gsize=4** uses Z1-Z4. Set the **gsize=6** to make the shim map.
4. Select **[Set Param] [Go Dssh]**. This step loads a set of parameters specifically for the gradient shimming sequence hence the **pw** and **tof** etc. will be different. These parameters are already optimized so do not alter them. A relatively symmetrical profile should appear. The second profile should be about 70% of the first profile. If there are spikes, the sample may have air bubbles. Sometimes **gzlvl=4000** will improve the profile. If the profile is abnormal, try starting from a current set of shims and manually shim again. Also, check the non-spinning shims.

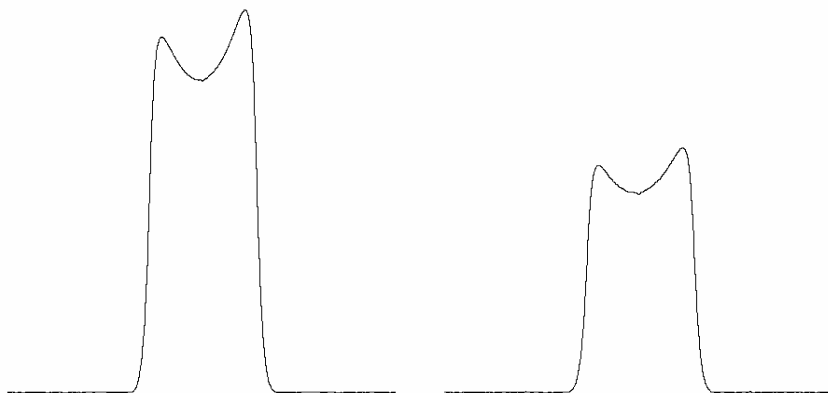


Figure 20: Normal gradient profiles for proton gradient shimming appear with the second profile being about 60-70% less intense than the first. The profiles should be relatively symmetrical without shoulders.

5. Find the gradient window: **[Find gzwin]**. This will find the **tof** and the value for **gzwin**.
6. After finding **gzwin**, the program exits the **gmapsys** menus.
To re-enter, **>gmapsys**
7. To make a shim map at this point: **[Shim Maps]**
[Make Shim Map] The user will be prompted for a name for the shim map.
With **gzsize=6**, the shim map will be made on Z1-Z6.
8. After the shim map is calculated, view it: **[Return] [DispMenu]**
[Display Shimmap] The shim map will be displayed on the screen.

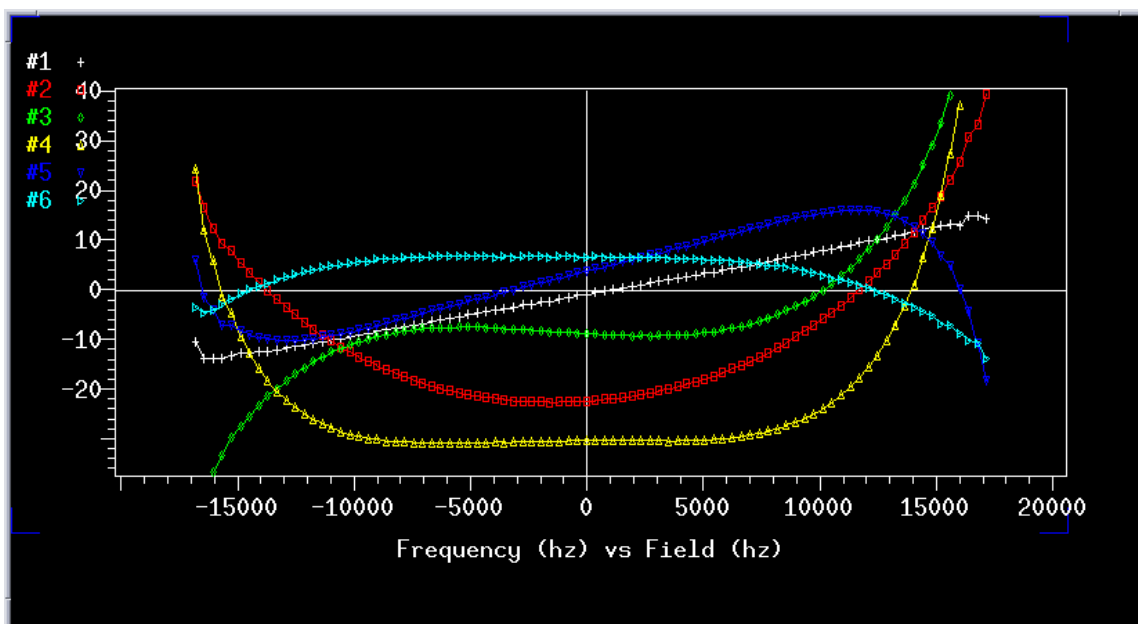


Figure 21: A good shimmap should be close to symmetrical about 0. This shimmap includes Z1-Z6 (**gzsize=6**).

Shim maps for short samples and Shigemi tubes often have rough edges. If the shim map looks abnormal at this point, go back and try manual and/or standard auto shimming from a set of current shims. If the sample is short and not properly centered on the probe coil, the map will also look poor. A sample shim map can be found in the Varian System Operations or Liquids User Guide manual under gradient autoshimming.

9. To autoshim, start by setting **gzsize=4**. Now auto-shim. **[Return] [Autoshim on Z]** The autoshimming will stop after it reaches an error value under 1. This step can be repeated again by selecting **[Autoshim on Z]**. The graph that appears should have as flat a red line as possible. Save the shims and try adding Z5 by using **gzsize=5** and run the autoshim on Z again. If that is successful, try adding Z6. Z5 and Z6 are sometimes driven to maximums and minimums so excluding them at the beginning can help.

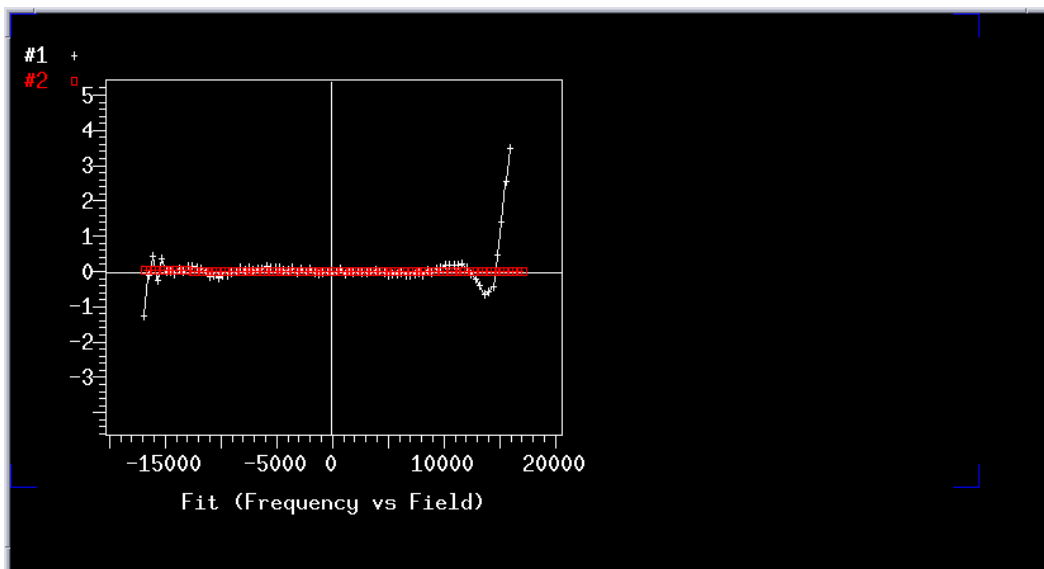


Figure 22: When the shims converge during gradient shimming, the fit may be similar to above with a very flat line (#2).

10. To end, select **[Quit]**

Problems seen in gradient shimming:

If the gradients are off or not functioning, the result is a singlet or a collapsed profile. Ask facility personnel to check the gradient unit.



If the **gain** too high, the profile will have “shoulders”. Set **gain=0**.



If the profiles very unsymmetrical, check the centering of the sample in the probe coil area. It is likely to be off center.



A spike on the profile on the side or in the middle is usually caused by air bubbles. This is a common problem in Shigemi tubes.

