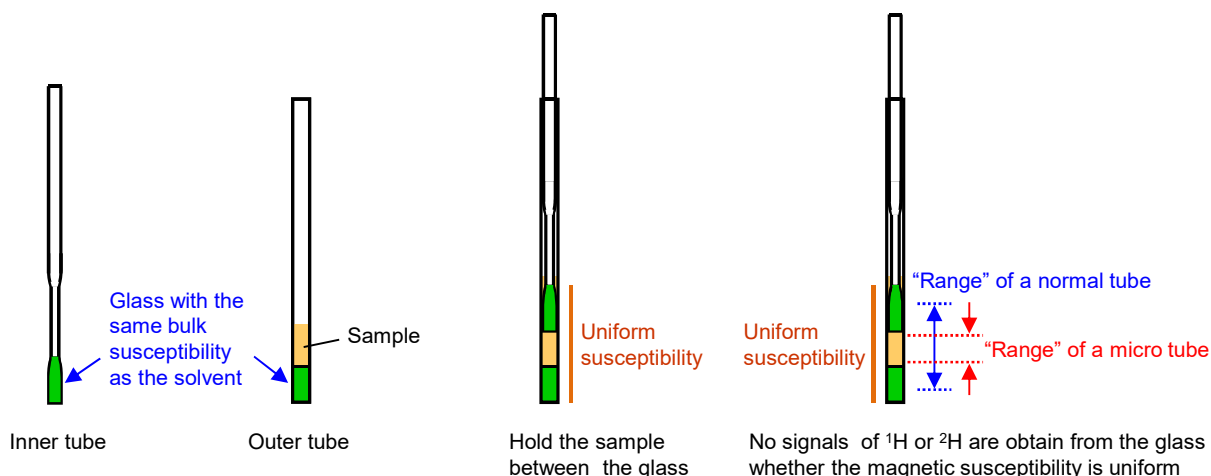


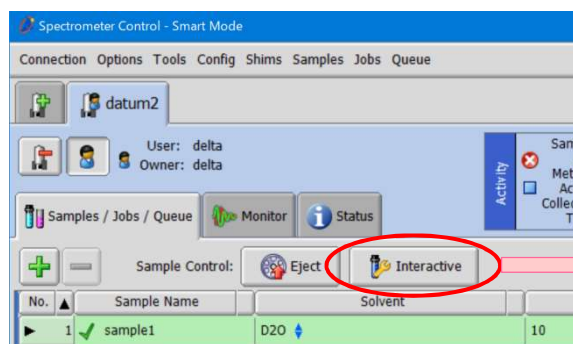
## How to perform gradient shimming, when you want to use micro tube?

Product used : Nuclear Magnetic Resonance Spectroscopy (NMR)

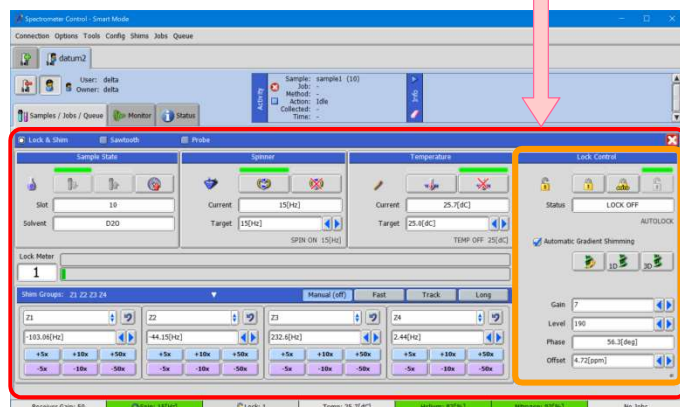
The symmetrical micro NMR tubes (Shigemi Co., Ltd., Tokyo, Japan) is very convenient, if you want to reduce the amount of samples. This sample tube is made with the same magnetic susceptibility as the solvent, and it doesn't have any NMR signals of  $^1\text{H}$  and  $^2\text{H}$ . Therefore, high resolution cannot be obtained when gradient shimming is performed with the default "range" which includes a glass part. For micro tubes, the "range" has to be narrower than the default.



Gradient shim conditions are set with "Gradient Shim Tool". Click [Open the Gradient Shim tool] button on [Lock Control] part in [Interactive Sample controls] panel to access this tool.



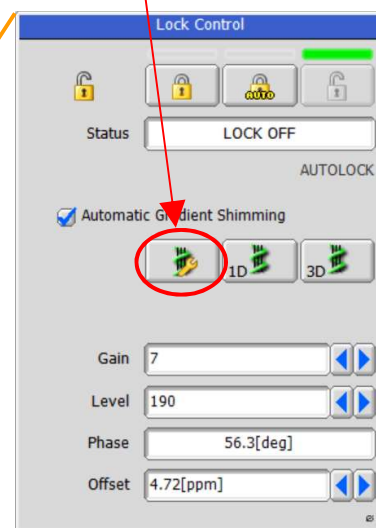
[Spectrometer Control] window



Open [Interactive Sample controls] panel

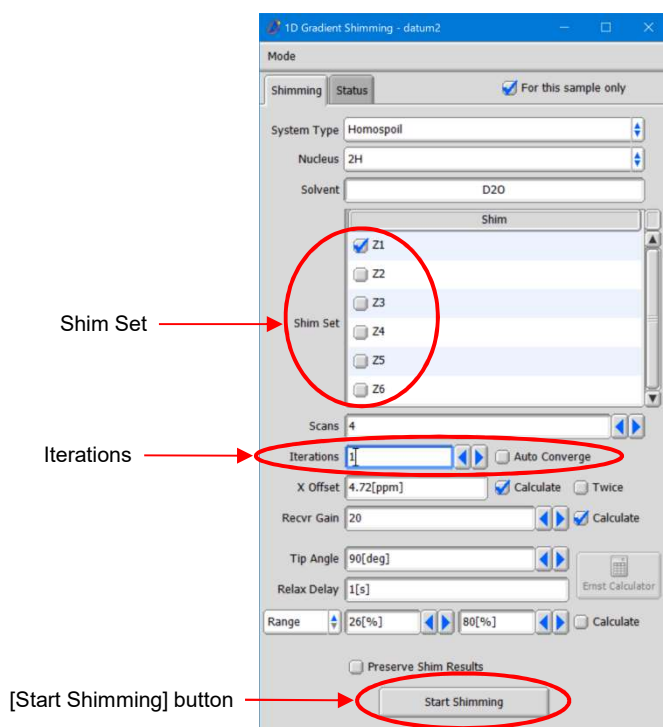
[Open the Gradient Shim tool] button

Click [Interactive] button



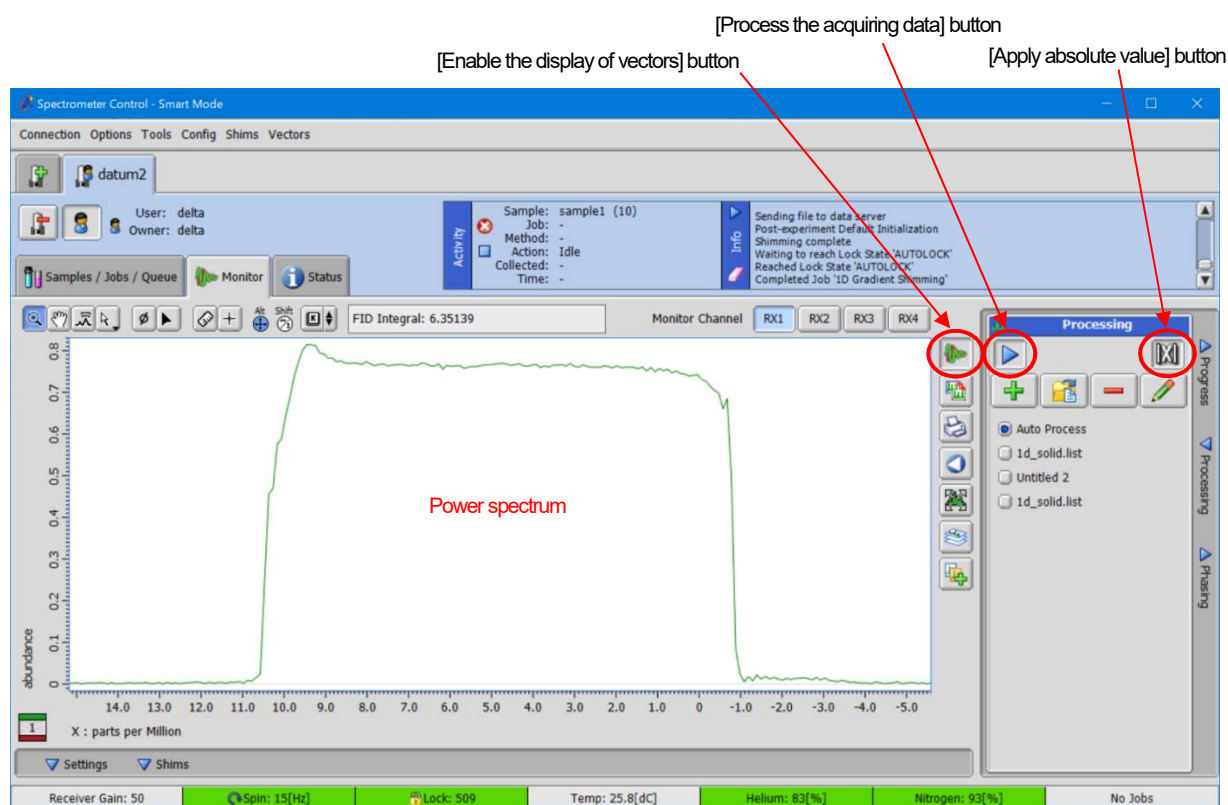
[Lock Control]

In Gradient Shim Tool, select only Z1 from “Shim Set” and set “Iterations” to 1. Then, click [Start Shimming] button to carry out gradient shimming.



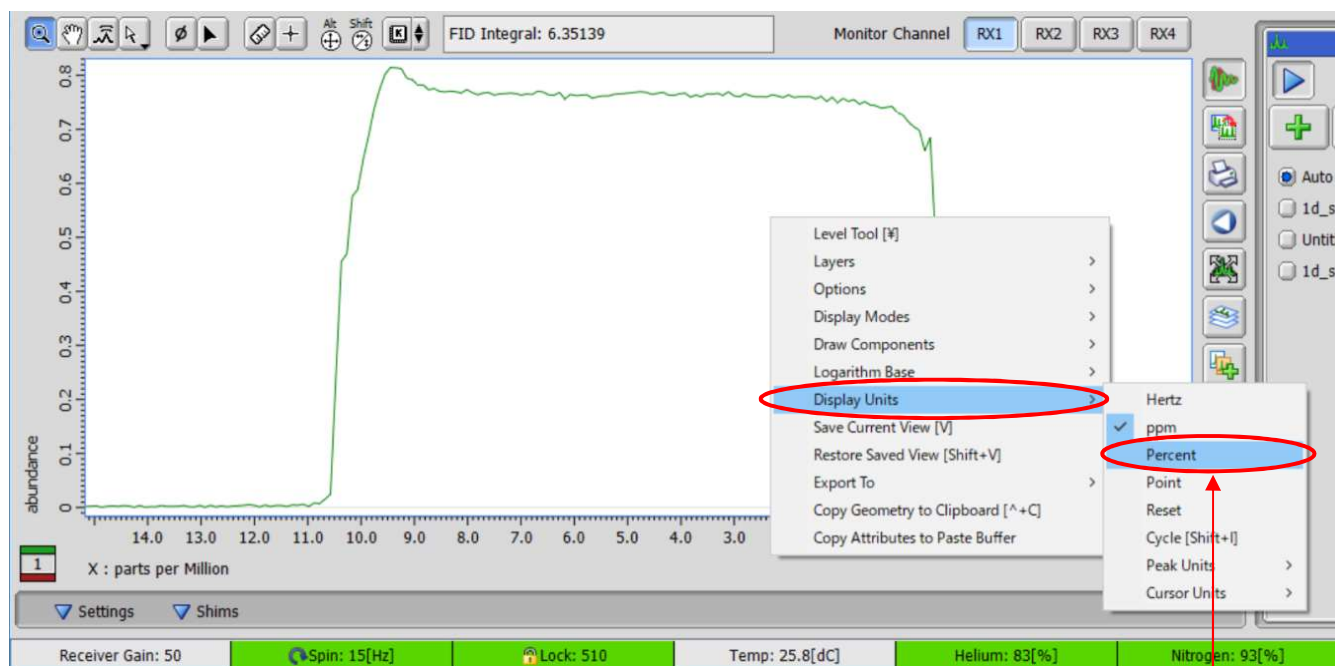
Gradient Shim Tool

After starting shimming, go to [Monitor] tab, and click [Enable the display of vectors] button to see the shimming result. Process a FID to convert to spectrum, then click [Apply absolute value] button to get a power spectrum.



[Monitor] tab

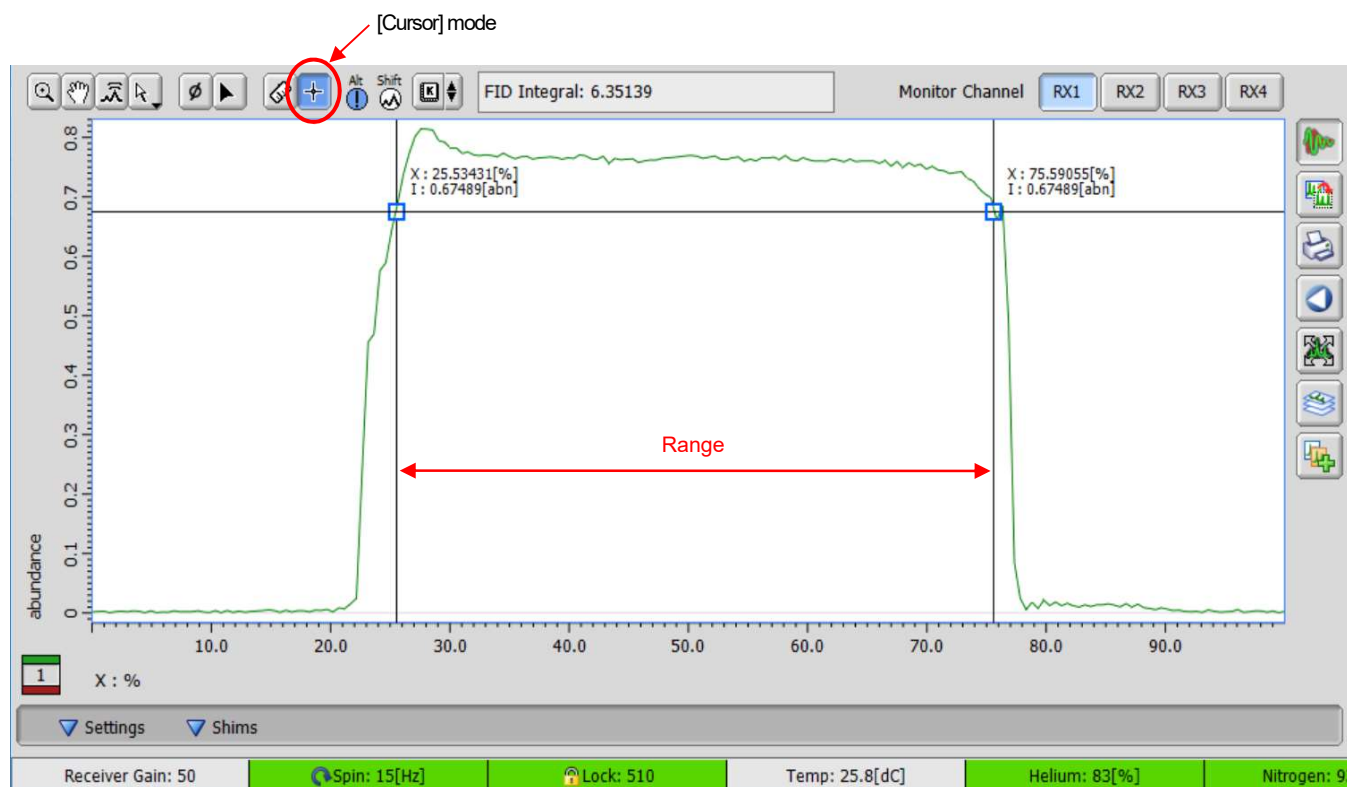
Select [Display Units] - [Percent] on the pop-up menu to set the horizontal axis to percentage.



[Monitor] tab

Set axis to percentage

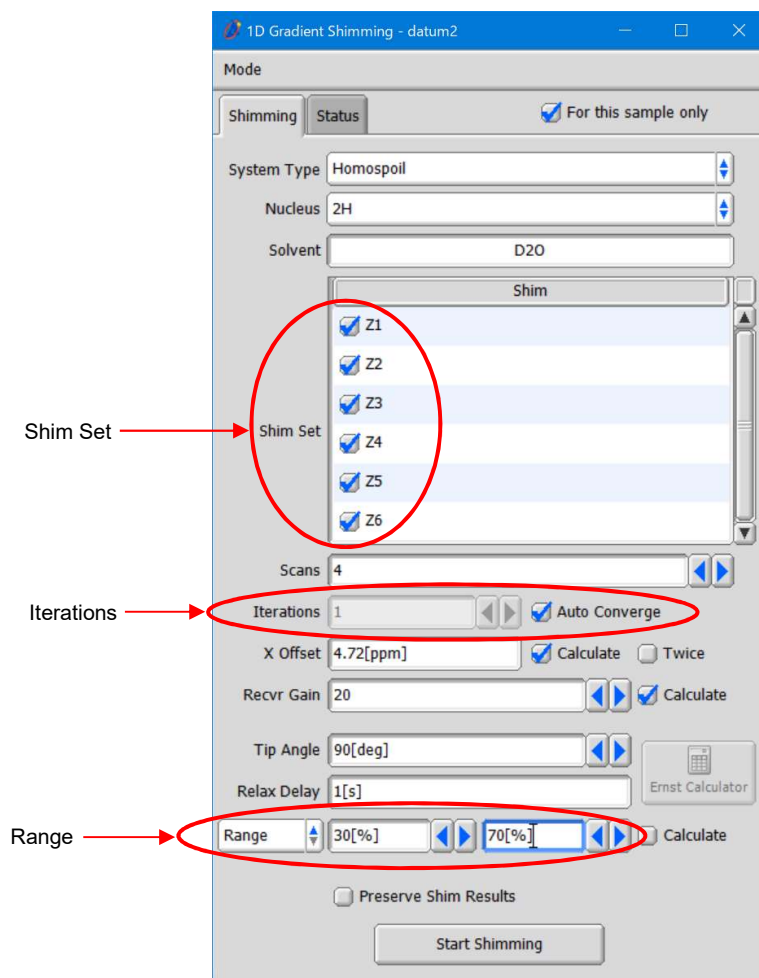
In [Cursor] mode, check the horizontal axis range using 80% of the maximum signal strength as a guide.



[Monitor] tab

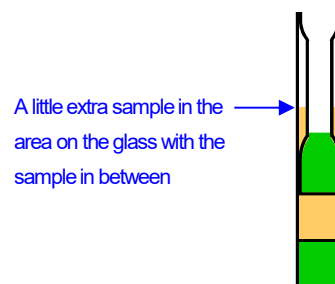
Go back to the Gradient Shim Tool, and enter the confirmed range in “Range” to complete the range setting. It is recommended that the Range be set a little narrower, not as wide as possible. In this example, there is no problem even if the range setting is 30% to 70%.

Then, select Z1 to Z6 of the “Shim Set” and select “Auto Converge” for “Iterations”. Click [Start Shimming] button to carry out gradient shimmming again. If shimmming diverges, use Z1 to Z4.



Gradient Shim Tool

Please note that air bubbles easily occur in the micro sample tube. When there are bubbles, the local magnetic susceptibility of the sample greatly disturbs in that area. The bubbles make it difficult to do shimmming with the gradient shim. In the case of a highly volatile solvent, it may volatilize during measurement, and air bubbles may occur. When using such a solvent, we need to take into account the volatility. If the sample volume is slightly larger as shown as the right figure, the resolution degradation due to a decrease in sample volume during measurement can be prevented.



Sample volume for highly volatile solvents

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