

Applications Newsletter

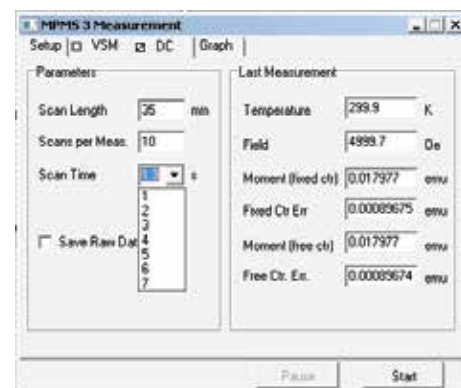
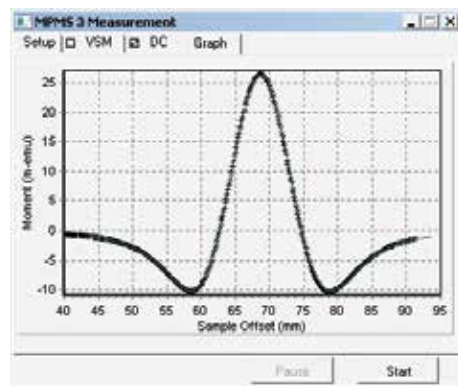
Winter 2014



Using Straw Sample Holders With DC Scan in the MPMS® 3

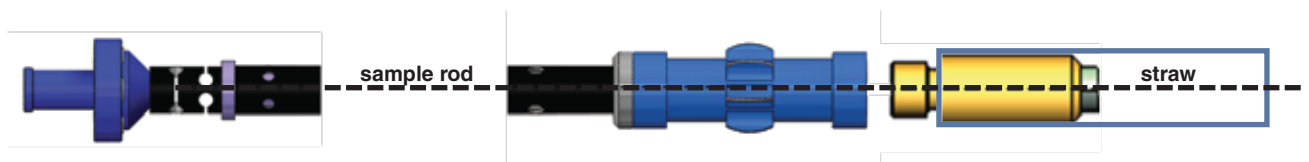
Users of Quantum Design's SQUID magnetometers have long preferred clear drinking straws for mounting many of their samples. The pigment-free polypropylene material construction of the straw is ideal for use in a gradiometer because it is weakly diamagnetic (free of ferromagnetic impurities), uniformly distributed along the length, and thin-walled. Note that Quantum Design can only endorse the particular straw we offer for sale (QD part # AGC2 - box of 500 pcs.). This newsletter, and our new Application Note ([1500-018](#)) on this subject, announce that straws are now officially approved for use on the MPMS 3.

DC Scan mode: In addition to the VSM measurement mode, DC Scan mode is now available in the MPMS 3. It is very similar to Standard Scan in the MPMS-XL, in that the sample is transported through the detection coils over a 3-4 cm distance, and the induced SQUID voltage vs. sample position waveform is then processed with an automatic curve fitting algorithm to yield the magnetic moment value of the sample. In the new DC Scan, point density per scan is increased 10 times for an average of about 600 points.



Sample Holders: In our SQUID magnetometers we utilize a second order gradiometer for detection coil design, which is very sensitive to any local variation over the scan length. To minimize the background signal, the operator needs to have a good understanding of the magnetic contribution from the sample holder and any additional material used for sample mounting. The following sample holders can all be used in the MPMS 3:

- **Quartz Paddle (C130A):** These sample holders have a very small diamagnetic background ($\sim 2 \times 10^{-6}$ emu at 7T). However, they are also fragile, and need to be handled with care.
- **Straw (AGC2) with Adaptor (4500-614):** Straws have a very small diamagnetic background ($\sim 3 \times 10^{-6}$ emu at 7T), which is similar to the quartz paddle. Their much lower cost make them a popular choice. To use, cut the straw to about 16 cm. Two straw adaptors (4500-614) are now provided with the user kit. Contact your local QD representative to obtain additional straws or adaptors.



Applications Newsletter

Winter 2014



Using Straw Sample Holders With DC Scan in the MPMS® 3 (Cont.)

- **Brass Trough (C130B):** Brass troughs have a larger diamagnetic background than straws and quartz paddles ($\sim 8 \times 10^{-6}$ emu at 7T), but this background is still small enough for a wide variety of samples. They are less fragile than quartz paddles and a good choice for bulk and powder samples. Please note, however, that there is often a ferromagnetic background of a few 10^{-6} emu at low field.
- **Liquid Sample Holder (C130D – includes Adaptor):** Ideal for liquid and air-sensitive samples, the liquid sample holder has a relatively larger diamagnetic background ($\sim 9 \times 10^{-4}$ emu at 7T). However, samples can be completely sealed for testing throughout the full temperature range of the MPMS 3 (1.8K to 400K).

Sample Mounting Tips:

- Always make sure sample is well secured. See more sample mounting tips in the following Application Note (<http://qdusa.com/sitedocs/appNotes/ppms/1096-306-Rev-B0.pdf>).
- Minimize supporting material that holds the sample and make this background uniform.

Optimize Measurement Parameters: A good set of starting parameters are to choose 35mm for *Scan Length*, and 4 sec for *Scan Time*.

More advice regarding straw sample holders can be found in the QD Application Note (http://qdusa.com/sitedocs/appNotes/mpms_3/1500-018.pdf) as well as in seminars located on Pharos at: <https://www.qdusa.com/pharos/view.php?fDocumentId=1712>.