Q u a n t u m   D e s i g n

MPMS Application Note 1014-212

Setting Small Fields Using the AC Option or the Ultra Low Field Option

Setting Small DC Fields Using the AC Option

With the AC option, use the MPMS to set small DC fields by setting a small DC current to the AC primary coil. The maximum field that can be set using the AC electronics is dependent on the B/I ratio of the AC primary coil. This B/I ratio is presented to the user as a system specific calibration factor, **Coil Cal 2.**

To determine the maximum DC field that can be applied for your system, multiply the **Coil Cal 2** factor by ± 100 mA (the output range). Typical **Coil Cal 2** factors for 1 Tesla, 5 Tesla, and 7 Tesla systems are 61 G/Amp, 45 G/Amp, and 80 G/Amp, respectively.

For example, for a 1 Tesla system with a **Coil Cal 2** factor of 61 G/Amp, DC fields of up to about 6 Gauss with resolution of about 0.19 mG can be set. For increased resolution, set the electronics in high-resolution mode, which sets DC fields of up to 60 mG (for a 1 Tesla system) with a resolution of approximately 0.0019 mG.

Using the AC Electronics to Set Small DC Fields

The small DC field is set by loading a bit count into the 16-bit DAC, feeding a buffer that, in turn, drives the AC primary coil. The output range is ± 100 mA with a resolution of approximately 0.00305 mA.

The following GPIB commands will prepare the system for setting small DC fields:

1. Activate Coil Relay **(ACR 1)** This sets the electronics into high-resolution mode, which increases the resolution to about 0.0019mG, but limits the maximum current to ±1 mA.

2. Activate Range Relay **(ARR 0)** This sets the AC drive electronics in low-resolution mode.

3. FIFO Reset **(FRS 1 1 count)** This count represents the count loaded into the drive DAC and can range from 0 (-100 mA) to 65535 (+100 mA), 32768 corresponds to 0 output current.

4. Output FIFO Enable **(OFE 1)**

Once the above commands are issued, it is only necessary to send the **FRS 1 1 count** command to adjust the output current. To turn off the AC electronics, issue the command **ACR 0**.

Note: If you have installed the External Device Control (EDC) software, you can use an EDC program to send the commands. The EDC program simplifies system setup for small DC field sweeps; you send only a series of **FRS 1 1 counts** and measure commands to the Model 1822.

Setting Small DC Fields Using the Ultra Low Field Option

With the Ultra Low Field (ULF) option, use the MPMS to set small DC fields by setting a small DC current in the copper coil located inside the DC magnet. The maximum field that can be set using ULF is dependent on the B/I ratio of the ULF primary coil. This B/I ratio is presented to the user as a system specific calibration factor, **Coil Cal 2.**

To determine the maximum DC field that can be applied for your system using ULF, multiply the **Coil Cal 2** factor by ± 50 mA (the output range). Typical **Coil Cal 2** factors for 1 Tesla, 5 Tesla, and 7 Tesla systems are 61 G/Amp, 45 G/Amp, and 80 G/Amp, respectively.

For example, for a 1 Tesla system with a **Coil Cal 2** factor of 61 G/Amp, DC fields of up to about 3 Gauss with resolution of about 0.092 mG can be set. For increased resolution, set the electronics in high-resolution mode, which sets DC fields of up to 30 mG (for a 1 Tesla system) with a resolution of approximately 0.00109 mG.

Using the Ultra-Low Field Option to Set Small DC Fields

The small DC field is set by loading a bit count into the 16-bit DAC, feeding a buffer that, in turn, drives the copper coil. The output range is ± 50 mA with a resolution of approximately 0.0015 mA.

The following GPIB commands will prepare the system for setting small DC fields:

1. Set Coil Relay **(SCR 1)** This sets the electronics into high-resolution mode, which increases the resolution to about .0009 mG, but limits the maximum current to ±0.5 mA.

2. Set Coil Gain **(SCG 0)** This sets the AC drive electronics in low-resolution mode.

3. Set Coil Current **(SCC #)** Where # is the amount of current to be sent to the copper coil (in mA).

Once the above commands are issued, it is only necessary to send the **SCC #** command to adjust the output current. To turn off the ULF electronics, issue the command **SCR 0**.

Note: If you have installed the External Device Control (EDC) software, you can use an EDC program to send the commands. The EDC program simplifies system setup for small DC field sweeps; you send only a series of **SCC #** and measure commands to the Model 1822.