Programmatic Sequences for the Automatic Adjustment of Double Relaxation Oscillation SQUID Sensors

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Measuring magnetic fields with a SQUID sensor always requires preliminary adjustments such as an optimum bias current determination and a flux-locking point search. A conventional magnetoencephalography (MEG) system consists of several dozens of sensors and we should condition each sensor one by one for an experiment. This time-consuming job is not only cumbersome but also impractical for the common use in hospital. We had developed a serial port communication protocol between SQUID sensor controllers and a personal computer in order to control the sensors. However, the serial-bus-based control is slow for adjusting all the sensors with sufficient accuracy in a reasonable time. In this work, we introduce programmatic control sequences that save the number of the control pulse arrays. The sequences separate into two stages. The first stage is a function for determining the optimum bias current that operates a sensor in a minimum noise level and the other stage is for searching flux-locking points of the sensors. Generally, the optimum bias current for a SQUID sensor depends on the manufactured structure, so that it will not easily change about. Therefore we can reduce the time for the optimum bias current determination by using the saved values which have been measured once by the first stage sequence. Applying the second stage sequence to a practical use, it has taken about 2-3 minutes to perform the flux-locking for our 37-channel SQUID magnetometer system.

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