

Biomagnetism of Venus flytrap plants

Anne Fabricant^{1,2}, Geoffrey Iwata¹, Lykourgos Bougas¹, Katharina Rolfs³, Anna Jodko-Włodzińska³, Jens Voigt³, and D. Budker^{1,2,4}

¹ Johannes Gutenberg-Universität Mainz, Germany

² Helmholtz-Institut Mainz, Germany

³ Physikalisch-Technische Bundesanstalt (PTB), Berlin, Germany

⁴ University of California, Berkeley, USA

Plant-biomagnetism experiments [1,2] aim to detect the magnetic fields produced by living plants, a challenging task due to the relatively small amplitudes and low frequencies of the signals. We focus on the Venus flytrap, *Dionaea muscipula*, a carnivorous plant which produces more “animal-like” action potentials (APs). In our lab we set up surface-electrode measurements for AP monitoring, and we conducted preliminary magnetometry measurements in a small magnetic shield using QuSpin optically pumped magnetometers (OPMs). Because our measurements were dominated by mechanical noise due to the stimulation method, we carried out two data runs in the shielded rooms at PTB, where we are able to conduct measurements without spatial constraints and with more sensors simultaneously. Our first PTB data run, in December 2018, took place in the 3-layer magnetically shielded room using up to 8 OPMs. This March we carried out an improved measurement run in the newly upgraded BMSR-2, using both OPMs and the SQUID system. Data analysis from these experiments is currently underway, with promising initial results.

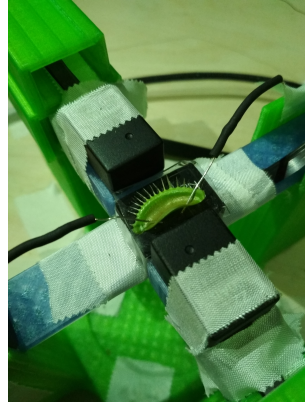


Figure 1. A flytrap sample being measured at PTB using 3 Gen-2 QuSpin sensors. Electrodes inserted into both ends of the trap monitor the action potentials produced by mechanical stimulation of tiny central trigger hairs.

- [1] E. Corsini, V. Acosta, N. Baddour, J. Higbie, B. Lester, P. Licht, B. Patton, M. Prouty, and D. Budker, Search for plant biomagnetism with a sensitive atomic magnetometer, *J. Appl. Phys.* **109**, 074701 (2011).
- [2] V. Jazbinsek, G. Thiel, W. Müller, G. Wübbeler, and Z. Trontelj, Magnetic detection of injury-induced ionic currents in bean plants, *Eur. Biophys. J.* **29**, 515-522 (2000).