

Towards a magnetic-field camera for biological applications

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To reconstruct small animals' heart activities a spatially resolved magneto-cardiogram (MCG) is essential. Magnetic source reconstruction requires a high spatial sensor resolution, a short working distance, sampling rates in the range of a few hundred Hertz and low noise contributions for MCG imaging [1]. An according measuring principle by a magnetic field camera (MC) was shown earlier in detail [2]. The MC is based on the light-shift dispersed (LSD) M_z -mode [3] in reflection geometry, see Figure 1 (a). The MC is designed for a spatial resolution of 2.5 mm for a magnetic field distribution in a plane 10 mm away from the vapor cell [1], 7 mm away from the thermal insulating housing. We will show first results on characterization of the MC setup, including measurements of homogeneity of the illumination pattern (Figure 1 (b)) and RF-field.

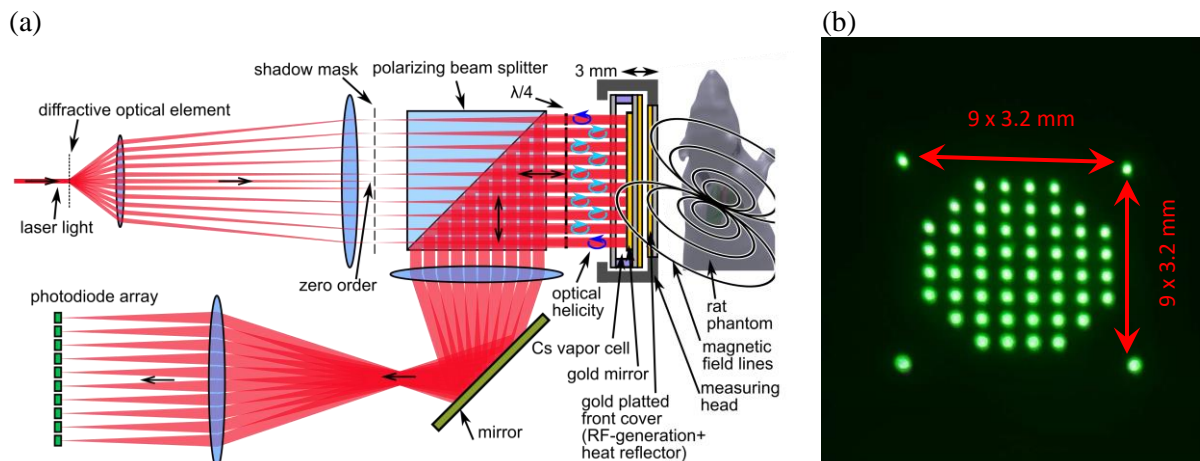


Figure 1. (a) Scheme of the magnetic field camera. An initial laser beam is split into 56 individual beams by a diffractive optical element guided via lenses into the Cs-vapor cell onto photodiodes. (b) Infrared image of the laser spots at the Cs vapor cell position, showing the same intensity within $\pm 2\%$. The different sizes and positions of the laser spots are artifacts of the infrared viewer used.

[1] R. Eichardt, D. Strohmeier, A. Hunold, R. Machts, J. Haueisen, G. Oelsner, C. B. Schmidt, V. Schultze, R. Stolz, U. Graichen, Sensitivity studies and optimization of arrangements of optically pumped magnetometers in simulated magnetoencephalography, *COMPEL*, **38**, 953 (2019).

[2] C. B. Schmidt, G. Oelsner, R. IJsselsteijn, V. Schultze, and R. Stolz, Optically pumped magnetic field camera – A proposal, book of abstracts - 5th Workshop on Optically Pumped Magnetometers, University of Fribourg, 72 (2017).

[3] V. Schultze, B. Schillig, R. IJsselsteijn, T. Scholtes, S. Woetzel, and R. Stolz, An Optically Pumped Magnetometer Working in the Light-Shift Dispersed M_z Mode, *Sensors*, **17**, 561 (2017).