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A Whole-head Neuromagnetic Measurement System Having Compact Sensor Structure

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Neuromagnetic measurements provide functional information of the human brain. In order to measure the magnetic field distribution of the head effectively, a superconducting quantum interference device (SQUID) system covering the whole head is needed. We developed a magnetoencephalography (MEG) system having 152 SQUID sensors to cover the whole head. The pickup coil is a wire-wound first-order gradiometer with a baseline of 50 mm. In order to increase the productivity of sensor fabrication, the superconductive connection between the pickup coil and SQUID sensor was made directly by using ultrasonic bonding of Nb wire. To simplify the SQUID control electronics, a novel double relaxation oscillation SQUID (DROS) scheme was used which provides large flux-to-voltage transfer. The SQUID insert has 152 first-order gradiometers arranged uniformly on the sensor helmet. The control of the SQUIDs and electronics were done by computer using a noise-free optical fiber. When the MEG system was operated inside a magnetically shielded room, the magnetic field noise of the system was about 3.5 fT/√Hz in the white region, including all the noise contribution of the SQUID, electronics, dewar, shielded room. As applications of the developed system, brain magnetic signals of spontaneous activity and evoked responses were measured.

Fig. 1. A photograph of the MEG system.

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Biocompatible Fe_3O_4 Nanoparticles as MRI Contrast Agent

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The biocompatible and water dispersible poly(amino acid) derivative, PHEA-C_{18}-C_8COOH, was employed to alter the surface property of hydrophobic iron oxide nanoparticles that exhibit high saturation magnetization. The different size Fe_3O_4 nanoparticles (4-11 nm) protected by hydrophobic ligands were chemically conjugated onto the hydrophilic poly(amino acid)s through a ligand-exchange reaction. The hydrophilic poly(amino acid)s conjugated Fe_3O_4 nanoparticles form small spherical self-aggregates with a core-shell morphology in aqueous solutions.

REFERENCES

[1] Kang, H. S.; Yang, S. R.; Kim, J.-D.; Han, S.-H.; Chang, I.-S. Langmuir 2001, 17, 7501-
[2] Sun, S. H.; Zeng, H.; Robinson, D. B.; Raoux, S.; Rice, P. M.; Wang, S. X.; Li, G. X. J. Am. Chem. Soc. 2004, 126, 273-279.