

## Characteristics of Pb Superconductive Shield for a Whole Head MEG System

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We have investigated the characteristics of Pb superconductive shields of (1) hemispherical and (2) planar shape to improve signal-to-noise ratio(SNR) in biomagnetism measurement. We have measured shielding factor as a function of (1) distance from Pb surface and, in the case of hemispherical shield, (2) position on the hemispherical surface. To make a uniform magnetic field, a 1.5 x 1.5-meter set of the Helmholtz coil driven at several frequencies. The shielding factor of hemispherical shield varied from 28 to 55 dB depending on the position on the hemispherical surface and decreased rapidly with increasing distance from the surface. Noise from Superconductive Quantum Interference Device (SQUID) with Pb superconductive shield was measured at about  $10 \text{ fT/Hz}^{1/2}$  at 1Hz and  $7 \text{ fT/Hz}^{1/2}$  at 100 Hz. White noise was more pronounced by about two times the conventional SQUID system without Pb shielding. MEG signal with auditory stimulation was measured by first order gradiometers and magnetometers with Pb superconductive shield and their SNR have been compared. The SQUID system with Pb shield had better performance for a low frequency fluctuation noise than without the shield.

Keywords : SQUID, magnetic noise, superconductive shield, a whole head MEG system