The Optimum Combination of the Pickup Coil Types and Magnetically Shielded Rooms for the Maximum SNR

Kwon-Kyu Yu[a], Yong-Ho Lee[a], Chan-Suk Kang[a], Jin-Mok Kim[a], Yong-Ki Park[a]
[a] *Bio-signal Research Center, Korea Research Institute of Standards and Science, Daejon, Korea*

We have investigated the optimum combination with a maximum Signal-to-Noise ratio (SNR), depending on the environmental noise condition and type of SQUID pickup coils. The measurement probe is consisted of 1st order gradiometer with 100 mm, 70 mm, 50 mm baseline length of the pickup coil and 2nd order gradiometer with 50 mm baseline and magnetometer. The pickup coils are fabricated by winding Nb wire on the bobbin with 200 mm diameter. Noise properties and heart signal of a healthy male were measured by various SQUID sensors with different types of pickup coils in each MSR, and compared to each other. The shielding factors of each MSR were indicated 43 dB, 35 dB and 25 dB at 0.1 Hz for the MSR-AS, MSR-BS, MSR-CS, respectively. White noises were 4 $fT/Hz^{1/2}$, 5 $fT/Hz^{1/2}$ and 3 $fT/Hz^{1/2}$ for 1st order gradiometers, 2nd order gradiometers and magnetometer at all MSR. SNR of the magnetometer is up to 56 dB in the MSR-AS, 1st order axial gradiometer with 70 mm baseline length has up to 54 dB in the MSR-BS, and 2nd order axial gradiometer with 50 mm baseline length of pickup coil is up to 40 dB in the MSR-CS.

Keywords: SQUID, magnetically shielded room, shielding factor, signal-to-noise ratio, MCG