

Construction of Magnetically Shielded Rooms of Various Performances for the Measurements of Biomagnetic Fields

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We have constructed several magnetically shielded rooms (MSR) for the measurement of biomagnetic signals. Depending on the environmental noise condition and type of SQUID pickup coils, we need to optimize the performance/cost ratio of the MSR. We fabricated three types of MSR (type-A, type-B and type-C) of different permalloy thickness, MSR structure and production cost. The structure of type-A was fabricated with a 1.05-mm thick permalloy and a 12-mm Al sheet. Type-B was fabricated with 1.05-mm thick permalloy(inner), a 7-mm Al sheet and 1.05-mm permalloy(outer). Type-C was constructed with 2.1-mm thick permalloy(inner), a 12 mm Al sheet, a 7 mm Al sheet and 2.1-mm thick permalloy(outer).

The shielding factors of each MSR were measured using a fluxgate magnetometer and large 3-axis helmholtz coil around the MSR. The shielding factors of each MSR were 25 dB, 35 dB, 43 dB at 0.1 Hz and 85 dB, 80 dB, 90 dB at 100 Hz, for type-A, type-B, type-C, respectively. The residual dc magnetic fields in each rooms were about 90 nT, 50 nT and 40 nT, for type-A, type-B, type-C, respectively.

Finally, we have measured magnetocardiogram signals in each MSRs using magnetometer, first order planar gradiometer and second order planar gradiometer, and compared the signal quality.

Keywords : SQUID, magnetically shielded room, magnetocardiogram, permalloy, shielding factor