

## Construction of a Whole-Head Magnetoencephalography System with Gradiometers Installed in the Vacuum Space

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We have developed a helmet-structure magnetoencephalography (MEG) system with axial gradiometers installed in the vacuum space of the helmet dewar. The 152 axial gradiometers have baseline of 50 mm, and pickup coil diameter of 20 mm. To reduce the thermal mass and stray pickup area of the gradiometer bobbin, the total length of the bobbin was made short by using a novel superconductive connection method. The superconductive connection between pickup coil wires and input coil pads was done using ultrasonic bonding of annealed Nb wires, without using intermediate bulky connection blocks or screws. For better cooling of the gradiometers, sintered alumina rods having higher thermal conductivity than fiber-glass reinforced plastic were used as the bobbin material. The inner neck diameter of the dewar is 100 mm, much smaller than the inner diameter of the helmet space (480 mm). In this way, the heat input through the neck diameter can be reduced. The fabricated system was installed inside a magnetically shielded room, and MEG signals were measured.

Keywords: SQUID, low-noise electronics, magnetoencephalography, magnetic measurement, cooling