

Simulation of Signal Amplitudes and Signal-to-Noise Ratios of 1st order and 2nd order Gradiometer with Various Baselines

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We investigated signal-to-noise ratios (SNRs) of magnetocardiography (MCG) signals using the first-order and the second-order gradiometers of different baselines. The MCG signals were measured using a measurement system with 61 magnetometers, which measure the normal magnetic component to the chest surface. The distance between the chest surface and the bottom of the dewar was change from 0 cm to 15 cm, and the MCGs were measured for each distance. By subtracting the other signals (distance = 1 to 15 cm) from the reference signal (distance = 0 cm), we could simulate the first-order and the second-order gradiometer signals with various baselines. In addition, to evaluate the reproducibility of the simulation, we fabricated the wire wound first-order and second-order gradiometers, which measured a normal magnetic component to the chest surface. The baselines of the first-order gradiometers were, respectively, 50 mm, 70 mm and 100 mm and the baseline of the second-order gradiometer was 50 mm. Using these gradiometers, we recorded the MCG signal and compared the SNR between the simulation and the measurement.

Keywords: signal-to-noise ratio, baseline, gradiometer