# Partial Principal Component Elimination Method for the Exclusion of Spontaneous Neuromagnetic Fields in the Multichannel SQUID Magnetoencephalography

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We employed a method eliminating a temporally partial principal component (PC) of multichannel-recorded neuromagnetic fields for excluding spatially correlated noises from event-evoked signals. The noises in magnetoencephalography (MEG) are considered to be mainly spontaneous neuromagnetic fields which are spatially correlated. In conventional MEG experiments, the amplitude of the spontaneous neuromagnetic field is much lager than that of the evoked signal and the synchronized characteristics of the correlated rhythmic noise makes it possible for us to extract the correlation noises from the evoked signal by means of the general PC analysis. However, the whole-time PC of the fields still contains a little projection component of the evoked signal and the elimination of the PC results in the distortion of the evoked signal. Especially, the distortion will not be negligible when the amplitude of the evoked signal is relatively large or when the evoked signals have a spatially-asymmetrical distribution which does not cancel out the corresponding elements of the covariant matrix. In the period of prestimulus, there are only the spontaneous fields and we can find the pure noise PC that is not including the evoked signal. In this study, we applied the partial principal component elimination method (PPCE) to simulated signals and the auditory evoked signals that had been obtained with our homemade 37-channel magnetometer-based SQUID system. We demonstrate here that PPCE reduces the number of epochs required in averaging to about half of that required in conventional averaging.

keywords : Alpha rhythm, brain noise, correlated noise, magnetoencephalography (MEG), spontaneous field, superconducting quantum interference device (SQUID)