Bimanual coupling is modulated in task-specific way through left frontocentral brain networks

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Abstract

When performing bimanual tasks, hands are typically not controlled individually but rather as a coupled system to achieve high spatiotemporal coordination. On a brain level, intra- and interhemispheric connections networks that control the left and right hand are necessary to exchange information between hemispheres and to couple movements. Behaviorally, coupling is, however, highly task-specific requiring, for example, to maintain a specific relative phase in cyclic tasks (e.g., in- or antiphase) or to perform a role differentiated task where one hand is modulating and the other hands is stabilizing and needs to be kept as still as possible (e.g., holding a notepad and writing on it). In this study, we used electroencephalography to investigate functional brain network characteristics (task-related activation and connectivity) in bimanual force-control tasks with different coordination modes: inphase, antiphase and role-differentiated with the left- or right-hand stabilizing and the other hand manipulating. We aimed to examine i) how network characteristics differ with respect to the coordination mode and ii) how they are related to the performance. Results showed, task-related differences in the overall activation and connectivity, but no task-specific patterns (i.e., different regions being more active or integrated during some tasks than others). We did show, however, that the strength of bimanual coupling is modulated in a task-specific way through networks including C3, FC3 and F3 electrodes. Results suggest that interhemispheric crosstalk for bimanual coordination is modulated in a task-specific way through left frontocentral networks.

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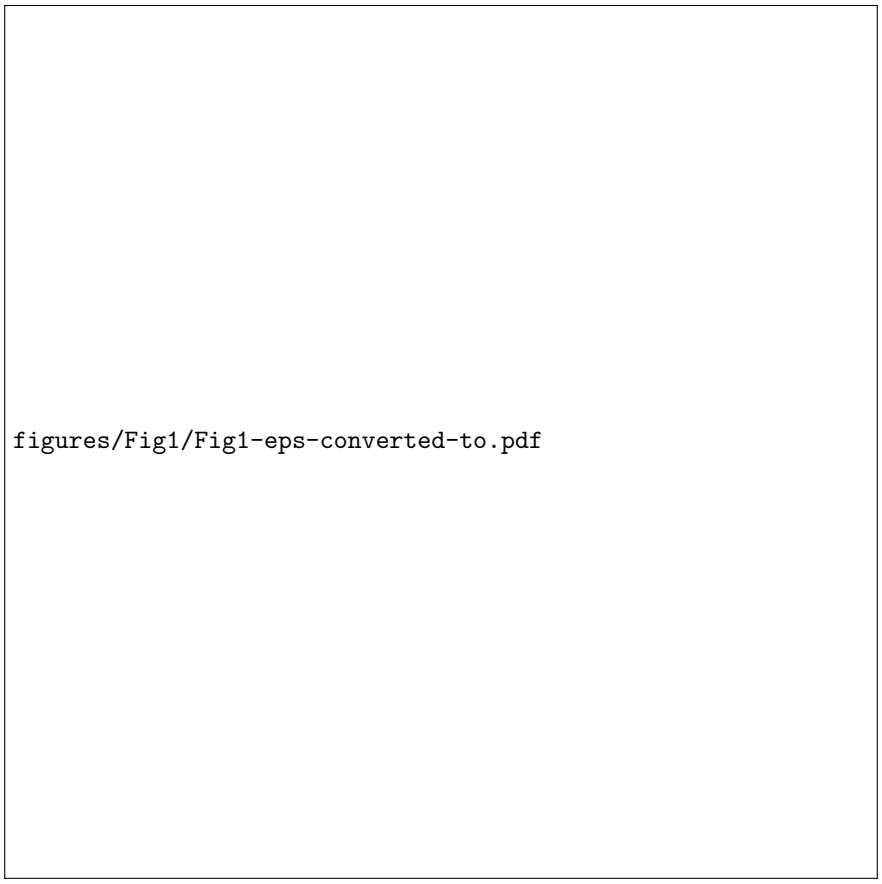

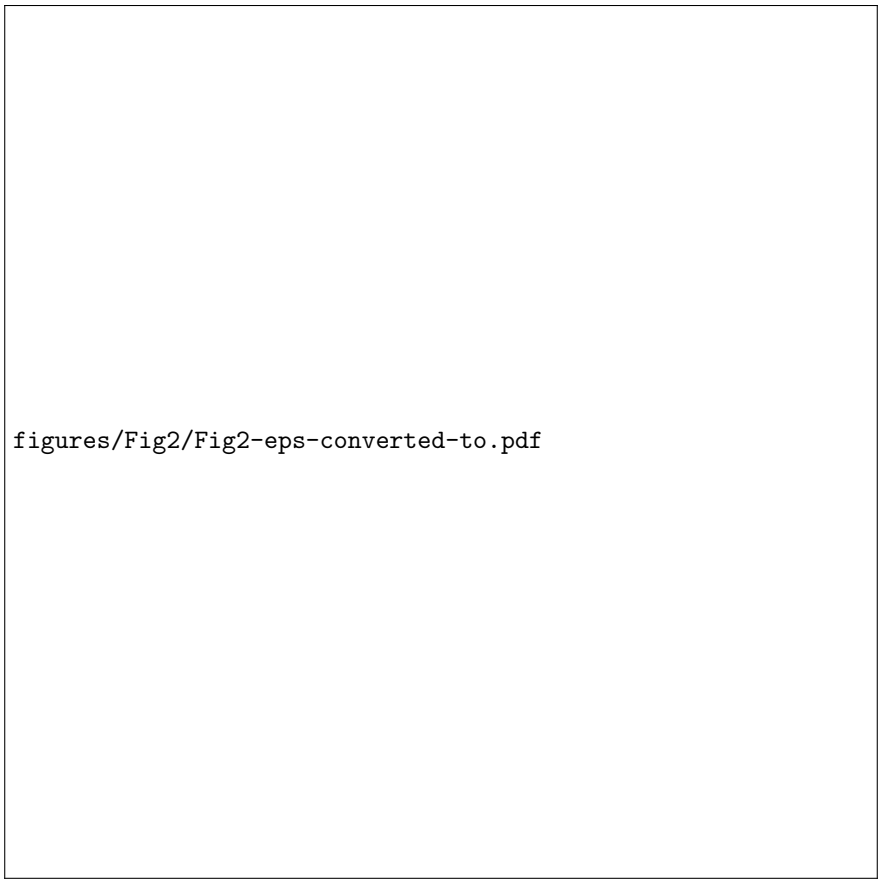

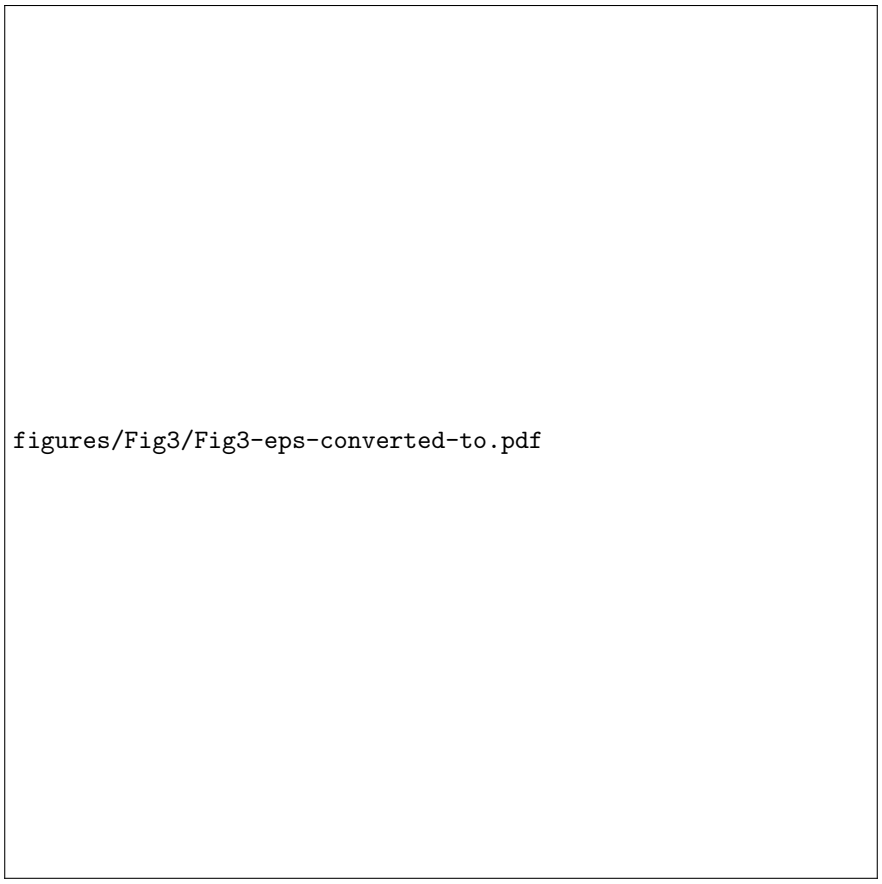

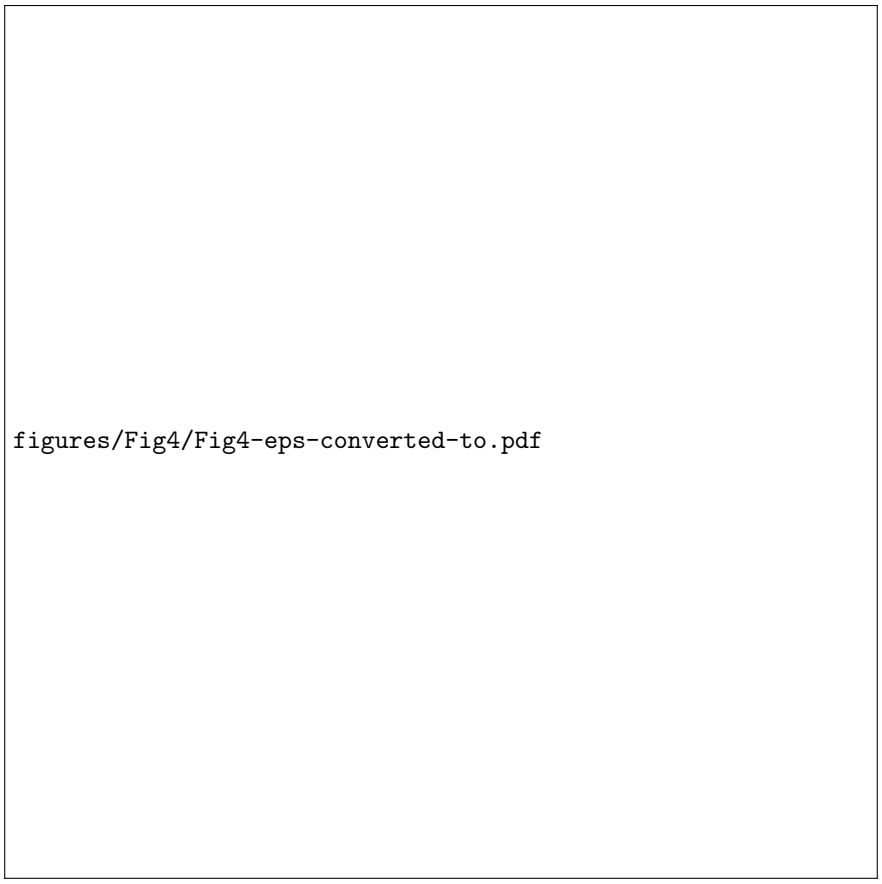

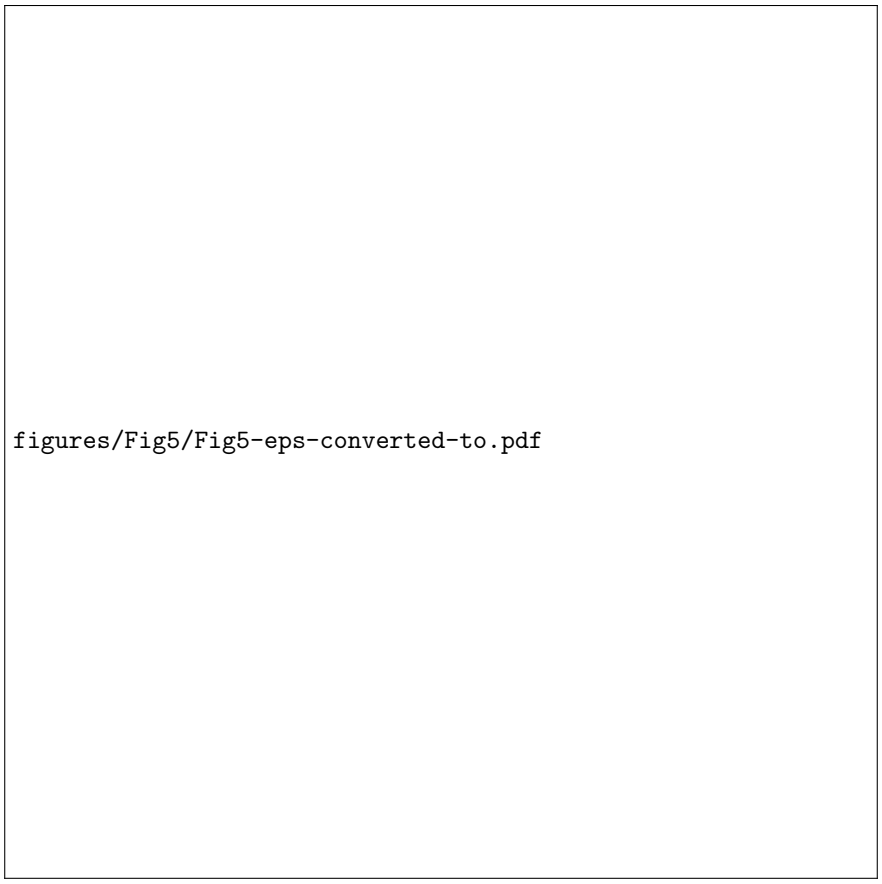

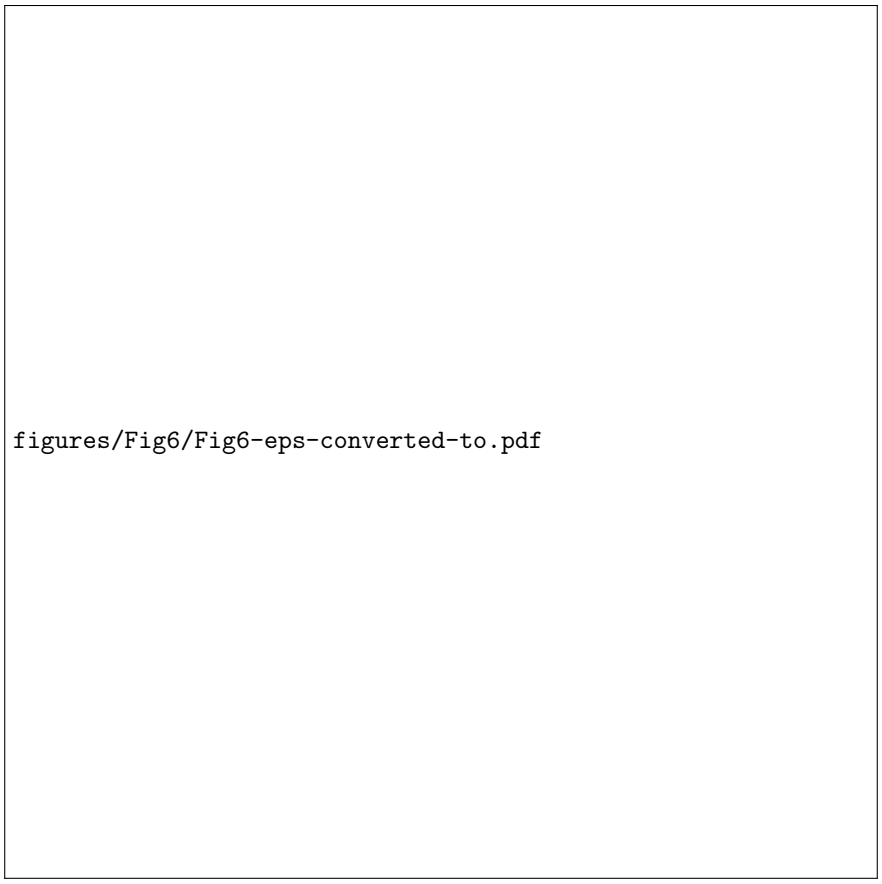

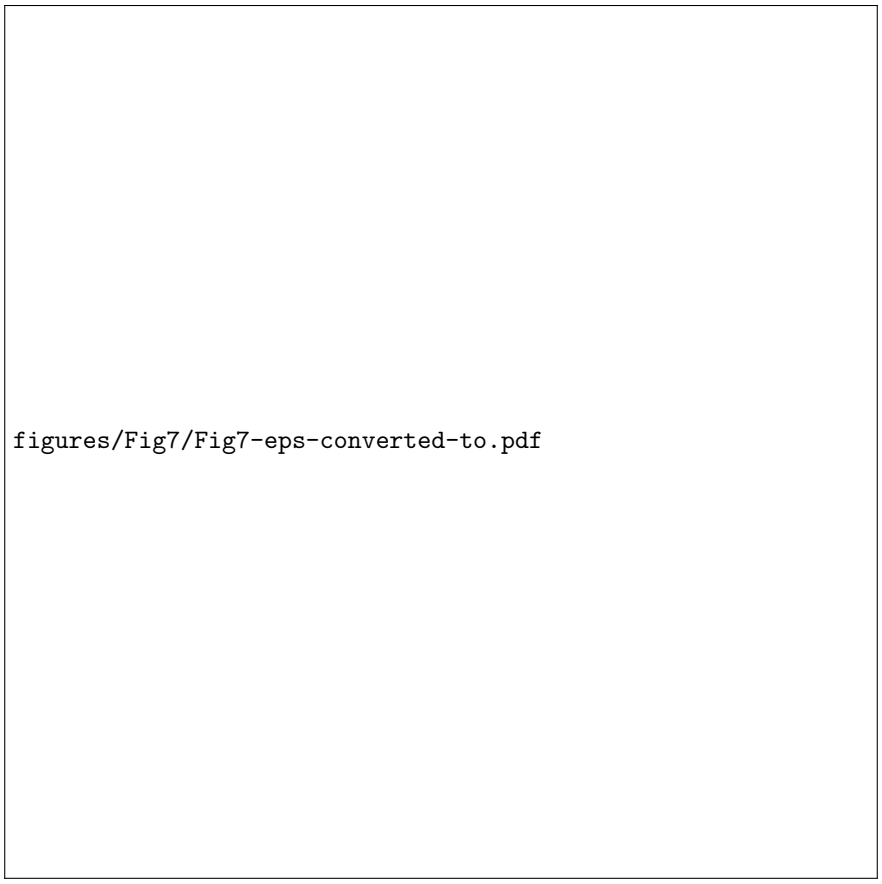

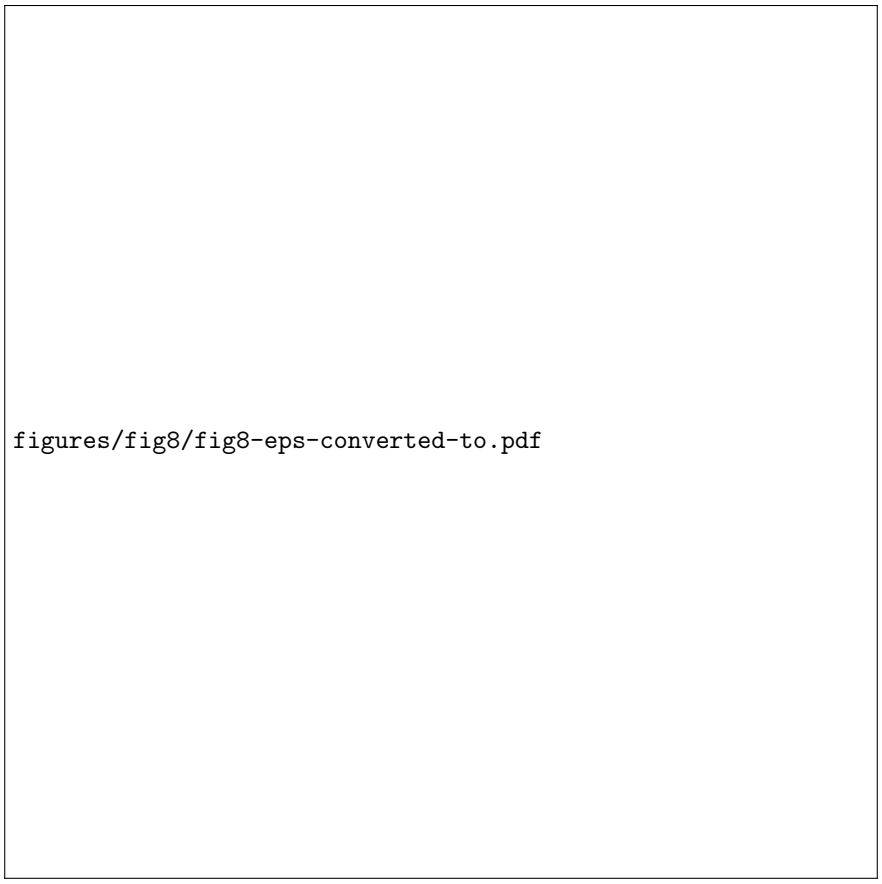

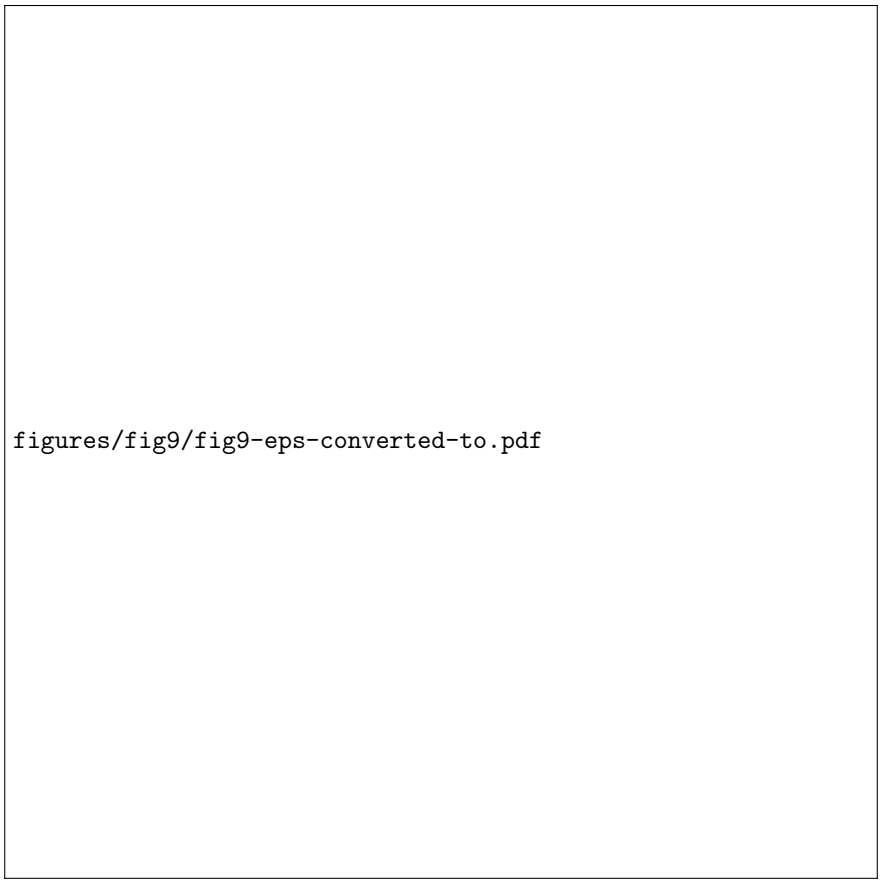

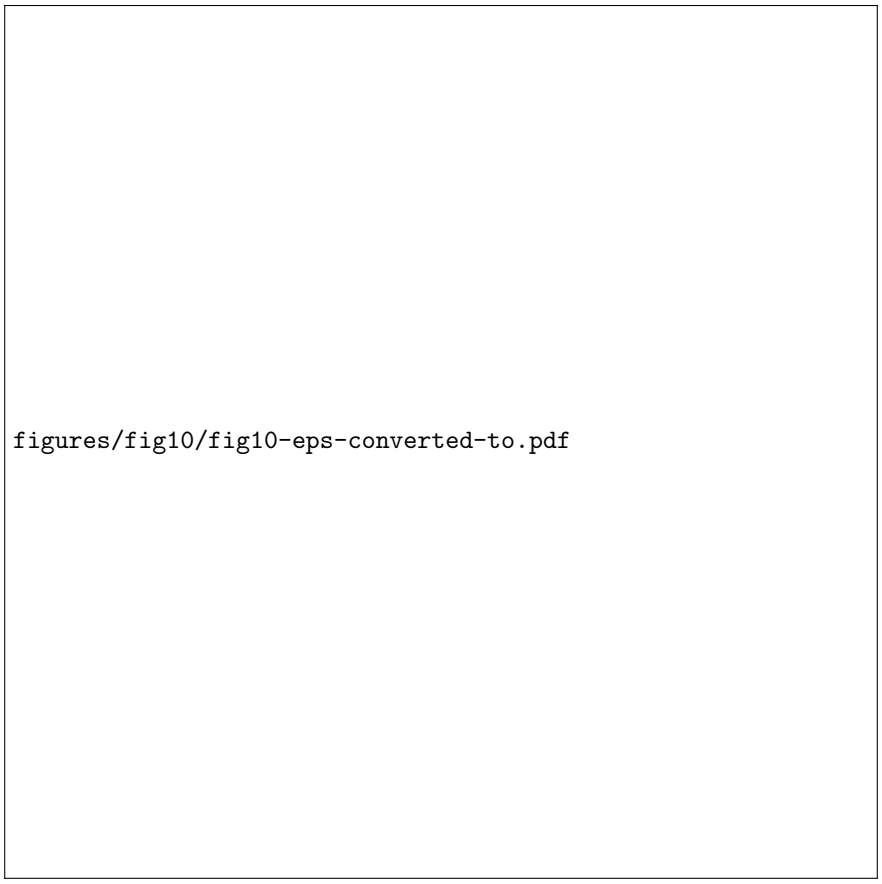

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