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## Numerical evidence for a CP broken deconfined phase at $\theta = \pi$ in 4D SU(2) Yang-Mills through simulations at imaginary $\theta$

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We investigate the possibility of the spontaneous breaking of CP symmetry in 4D SU(2) Yang-Mills at  $\theta = \pi$ , which has recently attracted much attention in the context of the higher-form symmetry and the 't Hooft anomaly matching condition. Here we provide a numerical evidence that the CP symmetry is indeed spontaneously broken at low temperature and it gets restored above the deconfining temperature at  $\theta = \pi$ , which is consistent with the anomaly matching condition and yet differs from the situation predicted in the large- $N$  limit. We avoid the severe sign problem by performing simulations at imaginary  $\theta$ . Then we estimate the relation between the critical temperature of the CP restoration and that of deconfinement at  $\theta = \pi$  by analytic continuation.

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