

Abstract Submitted
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The Atiyah-Patodi-Singer Index Theorem and Lattice Simulations SADATAKA FURUI¹, Teikyo University, Faculty of Science and Engineering — Atiyah, Patodi and Singer (APS) considered a system in a heat bath with proper boundary conditions. In the Hamiltonian formulation, difference of the number of zero modes in the time $t>0$ and that in the time $t<0$ are defined as Atiyah-Patodi-Singer Index. In Domain wall lattice simulation of QCD, difference of number of chirality + zero modes and chirality - zero modes was discussed by Fukaya et al.[1]. We replace zero modes of Dirac spinors to those of Weyl spinors and study 2 D convolutions of a soliton wave and time reversed soliton wave which belong to the Altland-Zirnbauer symmetry class DIII[2,3] . When beam directions of Khokhlov-Zaboltskaya soliton and that of its time reversed soliton are not parallel, there appear points where the convolution of the two solitons becomes negative near the boundary [4], which is related to the APS index in a bounded Riemann manifold. Relations to finite temperature lattice QCD will be discussed. [1] H. Fukaya et al, Phys. Rev. D 96, 125004 (2017). [2] S. Ryu et al, Phys. Rev. B 85, 045104 (2012). [3] I.A. Gruzberg et al, Phys. Rev. B 71, 245124 (2005). [4] S. Furui and S. Dos Santos, arXiv:2010.09487[physics.gen-ph]

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