



Contribution ID: 335

Type: **Talk**

## Dirac spectrum representation of Polyakov loop fluctuations in lattice QCD

*Friday, 17 July 2015 14:40 (20 minutes)*

We investigate contribution to the Polyakov loop fluctuations from each Dirac mode. The Polyakov loop fluctuations are sensitive probes for the quark deconfinement even if considering dynamical quarks. We derive analytical relations between the Polyakov loop fluctuations and Dirac modes on the temporally odd-number lattice, where the temporal lattice size is odd, with the normal non-twisted periodic boundary condition for link-variables. These relations indicate that low-lying Dirac modes have little contribution to the Polyakov loop fluctuations. We numerically confirmed that at the quenched level in both confinement and deconfinement phases. Our results suggest that there is no direct one-to-one correspondence between confinement and chiral symmetry breaking in QCD.

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**Session Classification:** Vacuum Structure and Confinement

**Track Classification:** Vacuum Structure and Confinement