

XVth Quark Confinement and the Hadron Spectrum



Contribution ID: 108

Type: Oral

Boundary states and non-Abelian Casimir effect in lattice Yang-Mills theory

Monday 19 August 2024 16:00 (20 minutes)

We investigate the vacuum structure of SU(3) Yang-Mills theory on the lattice in the presence of chromometallic mirrors both at zero and finite temperatures in 3+1 dimensions. The new excitation at the boundaries with the mass $m_{gt} = 1.0(1)\sqrt{\sigma} = 0.49(5)\text{GeV}$ which is more than three times lighter than mass of 0^{++} ground-state glueball was uncovered. We call this excitation “glueton” and interpret it as a non-perturbative colorless gluonic state of two gluons bound to their negatively colored images in a chromometallic mirror. The glueton is a gluonic counterpart of a surface electron-hole exciton in semiconductors. Additionally, we show that a heavy quark is linearly attracted to the mirror, and it presumably forms a “quarkiton” (“quark exciton”) colorless state with its anti-quark image in the chromometallic mirror.

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Session Classification: Vacuum Structure and Confinement

Track Classification: A: Vacuum Structure and Confinement