Contribution ID: **49** Type: **not specified**

The Casimir effect in Abelian and Non-Abelian lattice gauge theories: induced phase transitions and new boundary states

Tuesday, 28 February 2023 16:10 (20 minutes)

We investigate the vacuum structure of Abelian compact electrodynamics and Non-Abelian Yang-Mills theories in the presence of (chromo)metallic mirrors at zero temperature in 3+1 dimensions. By studying Abelian monopoles, responsible for linear confinement between opposite electric charges, we show that as the distance between plates diminishes, the vacuum of cQED between plates experiences a deconfining transition. While we found no thermodynamic signs of a Casimir-induced phase transition for the non-Abelian SU(3) gauge theory, we uncovered new excitation at the boundaries with the mass $m_{gt} = 1.0(1)\sqrt{\sigma} = 0.49(5)$ GeV which is more than three times lighter than mass of 0^{++} groundstate glueball. 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. Additionally, we show that a heavy quark is 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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