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Square root gauge theory and its applications

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We study the effects that a $\sqrt{-F_{\mu\nu}F^{\mu\nu}}$ in the action can have and we find,

1. Combined with a Maxwell term $-F_{\mu\nu}F^{\mu\nu}$ it gives a confining behavior.
2. adding a "mass term" $A_\mu A^\mu$, a source generates a Coulomb component with asymptotic strength independent of the charge at the source, the gauge fields produce a cloud of charge, so as to get always the same asymptotic Coulomb solution.
3. A scale invariant, generally coordinate invariant theory can be constructed by introducing both 1. a dilaton field ϕ , 2 a metric independent measure Φ constructed out of non metric degrees of freedom, "the measure fields, term $-F_{\mu\nu}F^{\mu\nu}$, $\sqrt{-F_{\mu\nu}F^{\mu\nu}}$, " $A_\mu A^\mu$ ", while $\sqrt{-F_{\mu\nu}F^{\mu\nu}}$, " $A_\mu A^\mu$ " couple to Φ , $-F_{\mu\nu}F^{\mu\nu}$ couples to $\sqrt{-g}$. The dilaton field ϕ can have kinetic terms that couple to the different measures and exponential potentials that couple to the different measures.

After sb of scale symmetry, bag like structures are found inside the bag there is a high vacuum energy and free gauge particles and outside there is a low vacuum energy and a confinement phase, or alternatively, inside the bag there is a high vacuum energy and free gauge particles and outside there is a low vacuum energy and a phase allowing the asymptotic Coulomb solution independent of the charge at origin, One can envision a picture where QCD suffers a confinement/ deconfinement phase transition, while QED suffers a transition from a regular massless photons phase to a phase which allows the source independent asymptotic Coulomb solutions, the cosmological consequences of the Coulomb solution will be discussed.

1. In these theories wormholes can "hide" charge by directing the gauge flux to the other universe, so for an external observer, some intrinsically charged object may appear neutral.

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