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Color field configuration between three static quarks

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Within Yang-Mills-Proca theory with external sources, regular, finite energy solutions are obtained. It is shown that color electric/magnetic fields have two components: the first part is a gradient/curl component, respectively, and the second part is a nonlinear component. It is shown that the color electric field has an Y-like spatial distribution.
Such an Y-like behavior arises because the gradient component of the electric field is present. The nonlinear component of the electric field is a curl one, and it appears because the vector potential sourced by a solenoidal current is present. The color magnetic field is purely curl one, since its nonzero color components do not contain a nonlinear component; this results in the fact that its force lines lie on the surface of a torus. It is shown that the results obtained are in good agreement with the results obtained in lattice calculations in quantum chromodynamics. To discuss such an agreement, we consider a procedure of nonperturbative quantization and discuss possible approximations ensuring such an agreement. Also, we compare the energy profiles obtained by us with those obtained in lattice calculations with a static potential.

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