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Dyon in pure SU(2) Yang-Mills theory with a gauge-invariant mass toward confinement-deconfinement phase transition

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The KvBLL instantons (calorons) are extensively used to understand confinement-deconfinement phase transition in the Yang-Mills theory at finite temperature. The KvBLL instanton is a topological soliton solution of the self-dual equation of the SU(2) Yang-Mills theory on $S^1 \times R^3$ space with instanton charge, which consists of BPS dyons having both electric and magnetic charges with non-trivial holonomy at spatial infinity. Recently, we have found a novel dyon solution as a non-BPS solution of (non self-dual) field equations of a gauge-scalar model with the radially fixed scalar field in the adjoint representation. This dyon solution of the gauge-scalar model is identified with the topological field configuration of the Yang-Mills theory with a gauge-invariant gluon mass term without scalar field, which is regarded as the low-energy effective model of the Yang-Mills theory with mass gap. This follows from the gauge-independent Higgs mechanism which does not rely on the spontaneous breaking of gauge symmetry. Our dyon has the non-vanishing asymptotic value corresponding to the non-trivial holonomy at spatial infinity to be comparable with the KvBLL dyon. Thus we can propose another scenario for reproducing confinement-deconfinement phase transition in the Yang-Mills theory at finite temperature based on our dyon solution. In this poster we show the existence of such dyons and discuss the characteristic properties, especially the asymptotic holonomy.

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