



High Energy Physics - Theory

# Domain wall solution in $F(R)$ gravity and variation of the fine structure constant

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We construct a domain wall solution in  $F(R)$  gravity. We reconstruct a static domain wall solution in a scalar field theory. We also reconstruct an explicit  $F(R)$  gravity model in which a static domain wall solution can be realized. Moreover, we show that there could exist an effective (gravitational) domain wall in the framework of  $F(R)$  gravity. In addition, it is demonstrated that a logarithmic non-minimal gravitational coupling of the electromagnetic theory in  $F(R)$  gravity may produce time-variation of the fine structure constant which may increase with decrease of the curvature, and that this model would be ruled out by the constraints on the time variation of the fine structure constant from quasar absorption lines. We also present cosmological consequences of the coupling of the electromagnetic field to a scalar field as well as the scalar curvature and discuss the relation between variation of the fine structure constant and the breaking of the conformal invariance of the electromagnetic field.

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