Second Order Field Dependent Lagrangian & It's Effect on Higgs Field

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Abstract

The Einstein generalized general relativity Lagrangian dependent on the second derivatives of the field, when use together with poison equation causes the mass term in the Lagrangian disappear. This means that Higgs field which was proposed to generate mass need to be revised. The work also aimed to see how Einstein generalized general relativity Lagrangian can affect Higgs field.

Keywords

Standard model, Higgs boson, Einstein generalized general relativity, Lagrangian

Introduction:

The ordinary Lagrangian is dependent on coordinate variables, beside generalized coordinates and their first derivatives unfortunately this Lagrangian is found to be unable to describe the generalized Einstein generalized general relativity (EGGR) without adding to it a second derivative in the generalized coordinate.

This paper is devoted to extend this notion to describe the general fields besides investigating its direct impact on Higgs field and its role in generating mass.

Second order field dependent Lagrangian:

The Lagrangian of (EGGR) is in the form:

$$L = L\,(x\gamma\,,\ \phi\,,\ \partial\mu\phi\,,\ \partial\mu\upsilon\phi) \qquad (1)$$

Where:

$$X\gamma = x_o\,,\ x_1\,,\ x_2\,,\ x_3$$

$$X_o = t,\ x_1 = x\,,\ x_2 = y\,,\ x_3 = z \qquad (2)$$

Thus the Lagrangian variation takes the form:

$$\delta L = \frac{\partial L}{\partial x_\mu}\partial x_\mu + \frac{\partial L}{\partial\phi}\delta\phi + \frac{\partial L}{\partial\partial_\mu\phi}\delta\partial_\mu\phi + \frac{\partial L}{\partial\partial_{\mu\upsilon}\phi}\delta\partial_{\mu\upsilon}\phi \qquad (3)$$

Where:

$$\delta x_\mu = 0 \qquad \delta\partial_\mu\phi = \partial_\mu\phi(x) - \partial_\mu\phi(x)$$

$$= \partial\mu[\phi(x) - \phi(x)]$$

$$= \partial\mu\partial\phi$$

$$\delta\partial_{\mu\upsilon}\phi = \partial\mu\upsilon\phi(x_1) - \partial\mu\upsilon\phi(x) = \partial\mu\upsilon[\phi(x) - \phi(x)]$$

$$= \partial_{\mu\upsilon}\delta\phi$$

Thus:

$$\frac{\delta L}{\partial\partial_\mu\phi}\delta\partial_\mu\phi = \frac{\partial L}{\partial\partial_\mu\phi}\partial x_\mu\,\partial_\mu\delta\phi = \partial\mu\left[\partial L\frac{\delta\phi}{\partial\partial\mu\phi}\right] - \partial\mu\frac{[\partial L]}{\partial\partial_\mu\phi}\delta\phi$$

Similarly:

$$\frac{\delta L}{\partial\partial_{\mu\upsilon}\phi}\delta\partial_{\mu\upsilon}\phi = \frac{\partial L}{\partial\partial_{\mu\upsilon}\phi}\partial_{\mu\upsilon}\,\delta\phi = \partial L\frac{\delta\mu}{\partial\partial_{\mu\upsilon}\phi} - \partial_\mu(\partial\upsilon\delta\phi)$$

$$= \partial\mu\left[\partial L\frac{\partial\upsilon\partial\phi}{\partial\partial_{\mu\upsilon}\phi}\right] - \partial\mu\left[\frac{\partial L}{\partial\partial_{\mu\upsilon}\phi}\delta\phi\right] - \partial\mu[\partial L]\,\partial\upsilon\delta\phi \qquad (4)$$

The Lagrangian of the electroweak field takes the form:

$$L = i\gamma\Psi\partial\mu\Psi - m\Psi\Psi - j\mu A\mu - \frac{1}{4}F_{\mu\upsilon}F \qquad (5)$$

Disappearance of mass term in the Lagrangian:

The second term in the Lagrangian is given by:

$$m_{\Psi\Psi} = \rho \qquad (6)$$

According to poison equation:

$$\Phi = \partial_{\mu\upsilon} = -c_1\rho \qquad (7)$$

Thus the mass term in L can be replaced by(5.2.6) to get:

$$L = L = i\gamma\mu\Psi\partial_\mu\Psi + C_o\partial_{\mu\upsilon}\phi - j^\mu A_\mu - \frac{1}{4}F_{\mu\upsilon}F$$

$$C_o = 1/C_1 \qquad (8)$$

It is clear that the mass term which prevents invariance disappear. According to equation (5.2.3) the mass term appears to be.

$$\delta L = i\gamma\mu\Psi\partial_\mu\Psi + C_o\partial_{\mu\upsilon}\phi \qquad (9)$$

Thus the need to Higgs fields variables to generate mass need to be revised.

Conclusion:

The new EGGR Lagrangian which depends on the second derivative of the field variables causes mass term to disappear in the Lagrangian.

Thus the non invariance of the mass term which motivates Higgs to propose his field needs to be revised to search for new mechanism to generate mass.

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