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Erratum: Observer Theories Based on Stueckelberg Equations of Motion

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There is a mistake in the derivation of the Stueckelberg–Jacobi formalism for the singular case (pages 487–488), for which equation (2.8) is satisfied for arbitrary λ'. It has no effect on any of the rest of the paper except as follows:

We must insert into the right sides of equations (2.31), (2.32), and (2.42) a factor of one-half; and on page 494, line 3, change $(1/2)\mu$ to μ; $p_\lambda \neq 0$ in equation (2.53).

To correct the mistake, we replace the portion starting with the second paragraph of page 487, and extending to the bottom paragraph of page 488 with the following:

'It sometimes may happen that equation (2.8) is satisfied for arbitrary λ'; in this case λ' cannot be eliminated from L_{SJ}, and it appears in equation (2.12) as an undetermined function of α. In addition, we may not use equation (2.8) or (2.14) in (2.12) to get (2.14) and (2.15) as functional forms because that step involves the tacit assumption that λ' can be eliminated. As arbitrary infinitesimal variations of λ are allowed in equation (2.11), so are arbitrary variations of

$$\mu = M(\lambda') \tag{2.17}$$

where M is any function. In particular, fixed endpoint variations of μ produce no additional contribution to $\delta'' A_{SJ}$ and we may regard μ as an extra coordinate if we so choose. This makes L_{SJ} a function of μ as well as x and x',

$$L_{SJ} = L_{SJ}(x, \mu, x') \tag{2.18}$$

and results in an additional Euler–Lagrange equation

$$\frac{\partial L_{SJ}(x, \mu, x')}{\partial \mu} = 0 \tag{2.19}$$

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We observe that L_{SJ} no longer has to be a homogeneous function of the (parametric) α-'velocities'.

'To determine the content of equation (2.19), we note that

$$\frac{\partial L_{SJ}(x,\mu,x')}{\partial \mu} = \left(\frac{dM}{d\lambda'}\right)^{-1} \frac{\partial L_{SJ}(x,\lambda',x')}{\partial \lambda'}$$

$$= -\left(\frac{dM}{d\lambda'}\right)^{-1} F(x,x',\lambda') \qquad \text{(E2.20)}$$

by equation (2.12), so (2.19) reduces to (2.8).

'We return momentarily to the formulation of (2.11) which regards just the x^{μ} as coordinates, and in which λ' appears in equation (2.12) as an undetermined function of α. That equation (2.8) is satisfied for arbitrary λ' means that it must be expressible as†

$$F(x,x') = 0 \qquad (2.25)$$

Equation (2.25) now selects from the solution to the x^{μ} equations a *particular* first integral. Here (the α-dependence of) $\lambda'(\alpha)$ is determined from the equations of motion for the x^{μ} deriving from (2.11), by means of the requirement that equation (2.25) be satisfied.'

† This is the equation numbering of the text; equations (2.21) to (2.24) now are missing in numbering only. We remark that equation (2.24) still is valid, by the argument leading to equation (2.25).