315(1): Vector Format of the JCE Identity

The JCE identity is, from UFT313:

$$D_\rho R^{\kappa}{}_{\lambda\mu\nu} + D_\nu R^{\kappa}{}_{\lambda\rho\mu} + D_\mu R^{\kappa}{}_{\lambda\nu\rho} \quad - (1)$$
$$:= T^{\alpha}{}_{\mu\nu} R^{\kappa}{}_{\lambda\rho\alpha} + T^{\alpha}{}_{\rho\mu} R^{\kappa}{}_{\lambda\nu\alpha} + T^{\alpha}{}_{\nu\rho} R^{\kappa}{}_{\lambda\mu\alpha}$$

Using Hodge duality, eq. (1) can be written as:

$$D_\mu \tilde{R}^{a}{}_{\lambda}{}^{\mu\nu} := R^{a}{}_{\lambda\mu\alpha} \tilde{T}^{\alpha\mu\nu} \quad - (2)$$

i.e. $$\partial_\mu \tilde{T}^{a\mu\nu} + \omega^{a}{}_{\mu b} \tilde{T}^{b\mu\nu} := \tilde{R}^{a}{}_{\mu}{}^{\mu\nu} \quad - (3)$$

The Cartan identity, is similar in structure to eq. (2), which can be written as:

$$\partial_\mu \tilde{R}^{a}{}_{\lambda}{}^{\mu\nu} + \omega^{a}{}_{\mu b} \tilde{R}^{b}{}_{\lambda}{}^{\mu\nu} := R^{a}{}_{\lambda\mu\alpha} \tilde{T}^{\alpha\mu\nu} \quad - (4)$$

i.e. $$\partial_\mu \tilde{R}^{a}{}_{\lambda}{}^{\mu\nu} := J^{a}{}_{\lambda}{}^{\nu} \quad - (5)$$

where:
$$J^{a}{}_{\lambda}{}^{\nu} = R^{a}{}_{\lambda\mu\alpha} \tilde{T}^{\alpha\mu\nu} - \omega^{a}{}_{\mu b} \tilde{R}^{b}{}_{\lambda}{}^{\mu\nu} \quad - (6)$$

Therefore:

$$\underline{\nabla} \cdot \underline{\tilde{R}}^{a}{}_{\lambda}(\text{spin}) = J^{a}{}_{\lambda}{}^{0} \quad - (7)$$

and
$$\underline{\nabla} \times \underline{\tilde{R}}^{a}{}_{\lambda}(\text{orbital}) + \frac{1}{c} \frac{\partial}{\partial t} \underline{\tilde{R}}^{a}{}_{\lambda}(\text{spin}) = \underline{J}^{a}{}_{\lambda} \quad - (8)$$

2) where:

$$\underline{J}^a_\lambda = J^a_{x\lambda}\,\underline{i} + J^a_{y\lambda}\,\underline{j} + J^a_{z\lambda}\,\underline{k} \quad -(9)$$

with:

$$J^a_{x\lambda} = J^{a1}_\lambda = J^{a32}_\lambda\,\epsilon^1{}_{32} \quad -(10)$$

$$J^a_{y\lambda} = J^{a2}_\lambda = J^{a13}_\lambda\,\epsilon^2{}_{13} \quad -(11)$$

$$J^a_{z\lambda} = J^{a3}_\lambda = J^{a21}_\lambda\,\epsilon^3{}_{21} \quad -(12)$$

In these equations the e/m field tensor is defined by:

$$F^\alpha_{\mu\nu} = A^{(0)}T^\alpha_{\mu\nu} \quad -(13)$$

and

$$\tilde{F}^{\alpha\mu\nu} = A^{(0)}\tilde{T}^{\alpha\mu\nu} \quad -(14)$$

So new electrodynamical equations can be constructed.
