SI Supplementary Information

Supplementary Equations

**Distortional Extrema and Holes in the Geometric Manifold**

For the presently described spherically symmetric Maxwellian case, ϕ, the electrostatic potential, is a function of *r* alone, and the Maxwellian electromagnetic tensor and the associated field tensor **F1μ**can be constructed according to equation (3), where the only surviving field tensor components are (following the symbolism and development of Tolman17):

$$ds^{2} = g\_{11}\left[ dr^{2}+ r^{2}dΩ \right]+ g\_{44}dt^{2} = - e^{μ}\left[ dr^{2}+ r^{2}dΩ \right]+ e^{ν}dt^{2} ,$$

$F\_{21} = - F\_{12} , F\_{13 }= - F\_{31 } and F\_{14} = - F\_{41} , $i.e.

$ T^{μν} = - g^{νβ}F^{μα}F\_{βα }+ \frac{1}{4} g^{μν}F^{αβ}F\_{αβ} or T^{μμ} = - g^{μμ}F^{μα}F\_{μα }+ \frac{1}{4} g^{μμ}F^{αβ}F\_{αβ} , $(3)

$$ then $$

$T\_{4}^{4} = \frac{\left(F\_{12}F^{12 }+ F\_{13}F^{13 }- F\_{14}F^{14}\right)}{2}, $ $T\_{1}^{1} = \frac{\left(- F\_{12}F^{12 }- F\_{13}F^{13}- F\_{14}F^{14}\right)}{2}, $

$T\_{2}^{2} = \frac{\left(- F\_{12}F^{12 }+ F\_{13}F^{13 }+ F\_{14}F^{14}\right)}{2} and $ $T\_{3}^{3} = \frac{\left(F\_{12}F^{1 2}- F\_{13}F^{1 3}+ F\_{14}F^{14}\right)}{2} . $

The resultant field quantities are

$\left(F\_{14}\right)^{2 } = - \left(T\_{4}^{4} + T\_{1}^{1}\right)g\_{11 }g\_{44} = \left(T\_{2}^{2 }+ T\_{3}^{3}\right)g\_{11 }g\_{44} , $ (4)

 $\left(F\_{12}\right)^{2 } = - \left(T\_{2}^{2 }+ T\_{1}^{1}\right)g\_{11 }g\_{11} and$ $\left(F\_{13}\right)^{2 } = - \left(T\_{3}^{3 }+ T\_{1}^{1}\right)g\_{11 }g\_{11} .$

Therefore, we see that the static-spherically-symmetric Maxwellian tensors exhibit the same stress and energy relationship as the geometric tensors17,

$ T\_{4}^{4 }= - \left(T\_{1}^{1 }+ T\_{2}^{2 }+ T\_{3}^{3}\right) . $(5)

The present geometric-modeling endeavor, with its Maxwellian-tensor-form mimicking-component, has produced the fundamental and limiting agent for the currently-studied distorted geometry, namely a particular constraining functional relationship between the geometry-defining tensors (for an empty-space geometry, all of the components of the energy-momentum tensor are zero). In using this simple equation-of-state, equation (5), as a restricting distortional-model tensor relationship, we thereby elicit the metric-defining differential equations for such a family of geometric distortions.

The geometric-energy-density or field equations (2-5), after using solution Eq. (9), are repeated here (from16); also see17;

$$Iu = -u\left[ \frac{3}{7}u^{6}-\frac{3}{4}u^{3}+1\right] , $$

$8πκ Td\_{1}^{1} = -e^{-μ}\frac{1}{\left(Iu - γ\right)}\left(\frac{u^{2}}{R0}\right)^{2}\left[ 2 u^{2}+\left(3 u^{3}-1 \right) \frac{1 - u^{3}}{\left(Iu - γ\right)} \right]$ ,

$8πκ Td\_{2}^{2} = e^{-μ}\frac{1}{\left(Iu - γ\right)}\left(\frac{u^{2}}{R0}\right)^{2}\left[ 4 u^{2}+ \left(3u^{3 }-1 \right)\frac{\left(1-u^{3}\right)^{2}}{\left(Iu - γ\right)}\right] $,

$$8πκ Td\_{4}^{4} = - 8πκ ( Td\_{1}^{1} + 2 Td\_{2}^{2} ) since Td\_{3}^{3}=Td\_{2}^{2} $$

or

$$ Td\_{4}^{4} = e^{-μ}\frac{1}{8πκ\left(Iu - γ\right)}\left(\frac{u^{2}}{R0}\right)^{2}\left[-6 u^{2}-\left(3u^{3 }-1 \right)\frac{\left(2u^{3}-1\right)\left(u^{3}-1\right)}{\left(Iu - γ\right)}\right] $$

and

$ 8πκ ( Td\_{2}^{2} + Td\_{1}^{1} ) = e^{-μ}\frac{1}{\left(Iu - γ\right)}\left(\frac{u^{2}}{R0}\right)^{2}\left[ 2 u^{2}- \left(3u^{3 }-1 \right)\frac{(1 - u^{3})u^{3}}{\left(Iu - γ\right)}\right] $ (6)

leading to

$$ \left(Fd\_{14}\right)^{2} = - g\_{11}g\_{44}\left(Td\_{4}^{4} + Td\_{1}^{1}\right) = g\_{11}g\_{44}\left(2 Td\_{2}^{2} \right) and $$

$ \left(Fd\_{14}\right)^{2}\left(r\rightarrow \infty \right)≝ \left(\frac{Rs}{2}\right)^{2}\frac{2}{8πκ} \frac{1}{r^{4}}=\frac{Rs^{2}}{2}\frac{1}{8πκ} \frac{1}{r^{4}} ≝\left(\frac{q}{4πεo r^{2}}\right)^{2}\frac{εo}{2}.$ (7)

$$ \left(Fd\_{12}\right)^{2}+ \left(Fd\_{13}\right)^{2} = 2 g\_{11}g\_{11}\left(\frac{Td\_{4 }^{4}- Td\_{1}^{1}}{2}\right) ≝ Fd\_{mag}^{2} =$$

$$ = - 2 g\_{11}g\_{11}\left(Td\_{1 }^{1}+ Td\_{2}^{2}\right) and $$

$$ \left(Fd\_{12}\right)^{2}+ \left(Fd\_{13}\right)^{2}\left(r\rightarrow \infty \right) = 2 Rs R0^{3}\frac{1}{8πκ} \frac{1}{r^{6 }} ≝ $$

 $≝ \frac{μo}{2}(\frac{ μ\_{spin}}{2π} )^{2}\frac{1}{r^{6}}$ (8)

where

$$ μ\\_spin ≝ ( \frac{g\_{e}}{2}\frac{Qe}{3M} ) S ℏ and g\_{e}= 2.0023193043 6 (for the electron) . $$

The field equations, in both the EM realm and the gravitational realm (*Q* = 0), exhibit *r-6* geometric behavior which we have interpreted as constituting a “magnetic monopole” mimic (what is a “magnetic monopole” ?).

References

16. D. Koehler, Geometric-Distortions and Physical Structure Modeling. *Indian J. Phys*. **87**, 1029 (2013).

17. R. Tolman, Relativity, Thermodynamics and Cosmology. Dover, NY, 248 (1987).