Table 1a: Metrics for the Coulomb and Ampère Maxwell Laws

Metric	Metrical Structure
Minkowski	$ds^2 = -c^2 dt^2 + dX^2 + dY^2 + dZ^2,$ $g_{00} = -1,\ g_{11} = 1,\ g_{22} = 1,\ g_{33} = 1$
Schwarzschild	$ds^2 = -\left(1 - \frac{2GM}{rc^2}\right) c^2 dt^2 + \left(1 - \frac{2GM}{rc^2}\right)^{-1} dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta\, d\phi^2,$ $g_{00} = -\left(1 - \frac{2GM}{rc^2}\right),\ g_{11} = \left(1 - \frac{2GM}{rc^2}\right)^{-1},\ g_{22} = r^2,\ g_{33} = r^2 \sin^2\theta$
Gödel	$ds^2 = \frac{1}{2\omega^2}\left(-\left(dt\,c + \exp(x)\,dz\right)^2 + dx^2 + dy^2 + \frac{1}{2}\exp(2x)\,dz^2\right)$ Diagonals and off-diagonals
FLRW	$ds^2 = -c^2 dt^2 + a(t)\left(\frac{dr}{1 - kr^2} + r^2 d\theta^2 + r^2 \sin^2\theta\, d\phi^2\right)$ $g_{00} = -1,\ g_{11} = \frac{a^2(t)}{1 - kr^2},\ g_{22} = a^2 r^2,\ g_{33} = a^2 r^2 \sin^2\theta$ with: $\frac{\ddot{a}}{a} = -\frac{4\pi}{3} G (\rho + 3p),$ $\left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi}{3} G\rho - \frac{k}{a^2}$
General Spherical	$ds^2 = -e^{2\alpha(r,t)} c^2 dt^2 + e^{2\beta(r,t)} dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta\, d\phi^2$ $g_{00} = -e^{2\alpha},\ g_{11} = e^{2\beta},\ g_{22} = r^2,\ g_{33} = r^2 \sin^2\theta$

Table 1a Continued

Metric	Metrical Structure
Crollers General	$ds^2 = -A\left(c(r)\right)^{1/2} dt^2 c^2 + B\left(c(r)\right)^{1/2} r^2 + c(r)\left(d\theta^2 + \sin^2\theta\, d\phi^2\right)$, where $c(r) = \left(\lvert r - r_0\rvert^n + \alpha^n\right)^{2/n}$
Crollers / Original Schwarzschild	$n = 3, \quad r_0 = 0, \quad r > r_0$
Crollers / Schwarzschild	$n = 1, \quad r_0 = \alpha, \quad r > r_0$
Crollers Type One	$ds^2 = -c^2 dt^2 + dr^2, \lvert r - r_0\rvert^2 \left(d\theta^2 + \sin^2\theta\, d\phi^2\right)$
Static de Sitter	$ds^2 = -\left(1 - \frac{r^2}{\alpha^2}\right) c^2 dt^2 + \left(1 - \frac{r^2}{\alpha^2}\right)^{-1} dr^2 + r^2 d\Omega^2$ $g_{00} = -\left(1 - \frac{r^2}{\alpha^2}\right), \quad g_{11} = \left(1 - \frac{r^2}{\alpha^2}\right)^{-1}, \quad g_{22} = r^2,$ $g_{33} = r^2 \sin^2\theta.$
Kasner	$ds^2 = -c^2 dt^2 + \sum_{j=1}^{D-1} t^{2p_j} (dx_j)^2,$ $\sum_{j=1}^{D-1} p_j = 1, \quad \sum_{j=1}^{D-1} p_j^2 = 1, \quad D > 3$
Perfect Fluid Sphere	$ds^2 = -(1 + ar^2) c^2 dt^2 + \frac{(1 - 3ar^2)^{2/3}}{(1 + 3ar^2)^{2/3} - br^2} \cdot dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta\, d\phi^2$
Friedmann Dust	$ds^2 = -c^2 dt^2 + \left(\cosh\left(\frac{3t}{a} - 1\right)\right)^{2/3} \left(x^2 + y^2 + z^2\right)$

Table 1b, Charge and Current Densities for the Metrics of Table 1a.

Metric	Charge and Current Densities
Minkowski	$J^0 = 0, \quad J_r = 0, \quad J_\theta = 0, \quad J_\phi = 0$
Schwarzschild	$J^0 = 0, \quad J_r = 0, \quad J_\theta = 0, \quad J_\phi = 0$
Gödel	$J^0 = 0, \quad J_r = 0, \quad J_\theta = 0, \quad J_\phi = 0$
Kasner	$J^0 = 0, \quad J_r = 0, \quad J_\theta = 0, \quad J_\phi = 0$
Crothers Type One	$J^0 = 0, \quad J_r = 0, \quad J_\theta = 0, \quad J_\phi = 0$
Crothers / Original Minkowski	$J^0 = 0, \quad J_r = 0, \quad J_\theta = 0, \quad J_\phi = 0$
Crothers / Minkowski	$J^0 = 0, \quad J_r = 0, \quad J_\theta = 0, \quad J_\phi = 0$
FLRW	$J^0 = -3\phi \dfrac{\ddot{a}}{a} = 4\pi \phi G(\rho + 3p)$, $J_r = -\dfrac{A^{(0)}}{\mu_0}\left(\dfrac{2}{a^4}(k+\ddot{a}^2)(kr^2-1) + \dfrac{\ddot{a}}{a^3}(kr^2-1)\right)$, $J_\theta = \sin^2\theta \, J_\phi = \dfrac{A^{(0)}}{\mu_0}\left(\dfrac{2}{a^4 r^2}(k+\ddot{a}^2) + \dfrac{\ddot{a}}{a^3 r^2}\right)$.
Crothers General	$J^0 = -\dfrac{\ddot{C}}{4ABC^2_{(0)}}\phi$, $J_r = -\dfrac{A^{(0)}}{\mu_0}\left(\dfrac{5C\ddot{C} - 4\dot{C}^2}{4B^2C^3}\right)$, $J_\theta = \dfrac{A^{(0)}}{\mu_0}\left(\dfrac{2BC^{1/2} - \ddot{C}}{2BC^{5/2}}\right)$, $J_\phi = \dfrac{J_\theta}{\sin^2\theta}$, where $\ddot{C} = \dfrac{d^2C}{dr^2}, \quad \dot{C} = \dfrac{dC}{dr}$.

Table 1b Continued.

Critters with defined $C(r)$	Here $C(r) = \left(\lvert r - r_0 \rvert^n + \alpha^n \right)^{2/n}$. Finite charge and current densities. In the special case: $r_0 = 0, \quad \alpha = 0$ the following are obtained. $J^0 = -\frac{\phi}{2r^4 AB}$, $J_r = \frac{A^{(0)}}{\mu_0} \cdot \frac{3}{2r^4 B^2}$, $J_\theta = \sin^2\theta . J_\phi = \frac{A^{(0)}}{\mu_0} \left(\frac{r^2 B - \lvert r \rvert}{r^6 B} \right)$
Static de Sitter	$J^0 = -\frac{3\phi}{r^2 - \alpha^2}$, $J_r = -\frac{A^{(0)}}{\mu_0} \left(\frac{3r^2 - 3\alpha^2}{\alpha^4} \right)$, $J_\theta = \sin^2\theta . J_\phi = \frac{A^{(0)}}{\mu_0} \cdot \frac{3}{\alpha^2 r^2}$
Wormhole Metric	$ds^2 = -c^2 dt^2 + dr^2 + (\ell^2 + k^2)(d\theta^2 + \sin^2\theta \, d\phi^2)$. Here: $J^0 = 0$, $J_r = -\frac{A^{(0)}}{\mu_0} \left(\frac{2k^2}{(\ell^2 + k^2)^2} \right)$, $J_\theta = J_\phi = 0$.
Alcubierre, Kerr and Charged Kerr	Here $R \wedge q \neq 0$ (?) so these metrics do not correctly obey the Ricci cyclic equation, usually known as the first Bianchi identity.

General Spherical Metric

Table 1b Continued

$$ds^2 = -c^2 dt^2 e^{2\alpha} + e^{2\beta} dr^2 + d\theta^2 + \sin^2\theta \, d\phi^2,$$

Here:

$$J^0 = \phi \left(e^{-2\beta - 4\alpha} \left(\left(e^{2\beta} \frac{d^2\beta}{dt^2} \right) + e^{2\beta} \left(\frac{d\beta}{dt} \right)^2 - \frac{d\alpha}{dt} e^{2\beta} \frac{d\beta}{dt} + e^{2\alpha} \frac{d\alpha}{dr} \frac{d\beta}{dr} - e^{2\alpha} \frac{d^2\alpha}{dr^2} \right) r - 2 e^{2\alpha} \frac{d\alpha}{dr} \right) \Big) \Big/ r,$$

$$J_r = \frac{A^{(0)}}{\mu_0} \left(e^{-4\beta - 2\alpha} \left(\left(e^{2\beta} \frac{d^2\beta}{dt^2} + e^{2\beta} \left(\frac{d\beta}{dt} \right)^2 - \frac{d\alpha}{dt} e^{2\beta} \frac{d\beta}{dt} + e^{2\alpha} \frac{d\alpha}{dr} \frac{d\beta}{dr} - e^{2\alpha} \frac{d^2\alpha}{dr^2} - e^{2\alpha} \left(\frac{d\alpha}{dr} \right)^2 \right) r + 2 e^{2\alpha} \frac{d\beta}{dr} \right) \right) \Big/ r,$$

$$J_\theta = J_\phi \sin^2\theta = \frac{A^{(0)}}{\mu_0} \frac{1}{r^4} e^{-2\beta} \left(\left(\frac{d\beta}{dr} - \frac{d\alpha}{dr} \right) r + e^{2\beta} - 1 \right).$$

The charge and current densities are <u>non-zero</u> in general.

Table 1b Continued

Metric	Charge and Current Densities
Friedman Dust	$J^0 = -\frac{\phi}{a^2}\left(6\tanh\left(\frac{3t-a}{a}\right)^2 - 9\right)$, $J_r = \frac{A^{(0)}}{\mu_0}\cdot\frac{3}{a^2\cosh\left(\frac{3t-a}{a}\right)^{2/3}}$, $= J_\theta = J_\phi$
Perfect Spherical Fluid	$J^0 = -\phi\Big(\big((1-3ar^2)^{1/3}(3ar^2+1)^{1/3}(7a^3br^6+7a^2br^4-4abr^2) + (1-3ar^2)^{1/3}(-18a^4r^6-23a^3r^4+6a^2r^2+3a)\big) / \big((3ar^2+1)^{1/3}(9a^5r^{10}+21a^4r^8+10a^3r^6-6a^2r^4-3ar^2+1)\big)\Big)$, $J_r = \frac{A^{(0)}}{\mu_0}\Big(\big((3ar^2+1)^{2/3}(3a^3b^2r^8+5a^2b^2r^6-4ab^2r^4-2b^2r^2) + (3ar^2+1)^{1/3}(-9a^4br^8-15a^3br^6+27a^2br^4+19abr^2+2b) - 9a^4r^6-63a^3r^4-47a^2r^2-9a\big) / \big((1-3ar^2)^{1/3}(3ar^2+1)^{2/3}(9a^4r^8+12a^3r^6-2a^2r^4-4ar^2+1)\big)\Big)$, $J_\theta = \cos^2\theta \cdot J_\phi = \frac{A^{(0)}}{\mu_0}\Big(\big((3ar^2+1)^{1/3}(7a^2br^6 + (1-3ar^2)^{2/3}(3a^2r^4+2ar^2-1) + abr^4-2br^2) - 18a^3r^6-5a^2r^4+6ar^2+1\big) / \big((1-3ar^2)^{2/3}(3ar^2+1)^{1/3}(3a^2r^8+2ar^6-r^4)\big)\Big)$