????

$$\partial_\mu F^{\mu\nu} = J^\nu,$$

(1)

$$\partial_\mu F_{\nu\rho} + \partial_\nu F_{\rho\mu} + \partial_\rho F_{\mu\nu} = 0,$$

(2)

6

$$F^{\mu\nu} = 0 - E_x - E_y - E_z E_x 0 - B_z B_y E_y B_z 0 - B_x E_z - B_y B_x 0.$$

$1, *a33,$
$F^{\mu\nu}(E_x, E_y, E_z)\{a_{ij}\}$

$0 - B_z B_y B_z 0 - B_x - B_y B_x 0$

$\{a_{ij}\}$
$(E_x, E_y, E_z)B_i$
(B_x, B_y, B_z)
$\partial_i \partial^i \quad x_i x^i$

$$\div *E = J^0, -\partial_t E^i - \partial_j \epsilon_{jik} B^k = J^i.$$

$J^\mu \rho * j$

$$J^\mu = (\rho, *j), \partial_\mu J^\mu = \rho t + \div *j = 0,$$

(3)

$$\div *E = \rho, *B = *Et + *j.$$

(4)

$F^{\mu\nu}$ $*E * B F^{\mu\nu} F^{\mu\nu} A^\mu$
μ, ν, ρ

$$\div *B = 0, *Bt + *E = 0.$$

(5)

$\rho * j$
$\{\div *E = \rho, *E = -*Bt, \ \div *B = 0, *B = *Et + *j.$

(6)

J^μ

$$\rho t + \div *j = 0.$$

(7)

$??A^{\mu 1}$
$_2 \quad \div *E \div *E$
$\rho * j$
$(\rho, *j) * E, *B$
$^3(\rho, *A) * E, *B$
$*E, *B$
$??A^\mu(\varphi, *A)$
$(\rho, *j)\rho, *j * E, *B$
$*E * B??*E * B$
$*A$
$F^{\mu\nu} = 0 - E_x - E_y - E_z E_x 0 - B_z B_y E_y B_z 0 - B_x E_z - B_y B_x 0, F_{\mu\nu} = 0 E_x E_y E_z - E_x 0 - B_z B_y - E_y B_z 0 - B_x - E_z - B$

(8)

$$\begin{cases} \div *E = \dfrac{\rho}{\epsilon_0}, *E = -*Bt, \ \div *B = 0, *B = \mu_0 \epsilon_0 * Et + \mu_0 * j. \end{cases}$$

(9)

$$\frac{1}{c^2}[2] * Et - *E = -\frac{1}{\epsilon_0}\rho - \mu_0 * jt, \frac{1}{c^2}[2] * Bt - *B = \mu_0 * j,$$

(10)

$$\frac{1}{c^2} = \epsilon_0 \mu_0$$

(11)

$*X 1/r$

$$*X = -U + *W,$$

(12)

$U * X$

$$U = \frac{1}{4\pi} \int [3] *r' \frac{' \cdot *X(*r')}{*r - *r'} - \frac{1}{4\pi} \oint_S S * n \cdot \frac{*X(*r')}{*r - *r'},$$

(13)

$$*W = \frac{1}{4\pi} \int [3] *r' \frac{' \times *X(*r')}{*r - *r'} - \frac{1}{4\pi} \oint_S S * n \times \frac{*X(*r')}{*r - *r'}.$$

(14)