Stress tensor

$$\overleftrightarrow{T}_{ij} = \varepsilon_0 \left(E_i E_j - \frac{1}{2} \delta_{ij} \vec{E}^2 \right) \qquad (1)$$

$$+ \frac{1}{\mu_0} \left(B_i B_j - \frac{1}{2} \delta_{ij} \vec{B}^2 \right)$$

$$\left(\nabla \cdot \overleftrightarrow{T} \right)_j \underset{(1)}{=} \frac{\partial}{\partial r_i} T_{ij} =$$

$$= \varepsilon_0 \left(\left(\vec{\nabla} \cdot \vec{E} \right) \vec{E}_j + \left(\vec{E} \cdot \vec{\nabla} \right) \vec{E}_j - \frac{1}{2} \vec{\nabla}_j \vec{E}^2 \right)$$

$$+ \frac{1}{\mu_0} \left(\left(\vec{\nabla} \cdot \vec{B} \right) \vec{B}_j + \left(\vec{B} \cdot \vec{\nabla} \right) \vec{B} - \frac{1}{2} \vec{\nabla}_j \vec{B}^2 \right)$$

$$= \left(\nabla \cdot \overleftrightarrow{T} \right)_j \qquad (2)$$

$$\vec{F} = \int \left(\vec{E} + \vec{v}\times\vec{B}\right)\rho\, d^3r =$$

$$= \int \underbrace{\left(\rho\vec{E} + \vec{J}\times\vec{B}\right)}_{\vec{f}} d^3r \qquad (3)$$

$$\vec{f} = \varepsilon_0\left(\vec{\nabla}\cdot\vec{E}\right)\vec{E} + \frac{1}{\mu_0}\left(\vec{\nabla}\times\vec{B} - \overset{\varepsilon_0\mu_0}{\frac{1}{c^2}}\frac{\partial E}{\partial t}\right)\times\vec{B} \qquad (4)$$

$$+ \vec{E}\times\left(\vec{\nabla}\times\vec{E}\right)$$

$$\frac{\partial\vec{E}}{\partial t}\times B = \frac{\partial}{\partial t}\left(\vec{E}\times\vec{B}\right) - \vec{E}\times\underbrace{\frac{\partial\vec{B}}{\partial t}}_{-\vec{\nabla}\times\vec{E}} \qquad (5)$$

$$\vec{f} \underset{(4,5)}{=} \varepsilon_0\left[\left(\vec{\nabla}\cdot\vec{E}\right)\vec{E} - \vec{E}\times\left(\vec{\nabla}\times\vec{E}\right)\right] \qquad (6)$$

$$+ \frac{1}{\mu_0}\left[-\vec{B}\times\left(\vec{\nabla}\times\vec{B}\right)\right] - \varepsilon_0\frac{\partial}{\partial t}\left(\vec{E}\times\vec{B}\right)$$

$$\left(\vec{\nabla}\cdot\vec{B}\right)B$$

$$\vec{E} \times \left(\vec{\nabla} \times \vec{E}\right) = \frac{1}{2} \vec{\nabla}\left(\vec{E}^2\right) - \left(\vec{E} \cdot \vec{\nabla}\right) \vec{E} \qquad (7)$$

$$\vec{f} \underset{(6,7)}{=} \varepsilon_0 \left[\left(\vec{\nabla} \cdot \vec{E}\right) \vec{E} + \left(\vec{E} \cdot \vec{\nabla}\right) \vec{E} \right]$$

$$+ \frac{1}{\mu_0} \left[\left(\vec{\nabla} \cdot \vec{B}\right) \vec{B} + \left(\vec{B} \cdot \vec{\nabla}\right) B \right]$$

$$- \vec{\nabla} \left(\frac{\varepsilon_0 \vec{E}^2}{2} + \frac{\vec{B}^2}{2\mu_0} \right)$$

$$- \varepsilon_0 \frac{\partial}{\partial t} \left(\vec{E} \times \vec{B}\right) \qquad (8)$$

$$\vec{f} \underset{(8,2)}{=} \vec{\nabla} \cdot \overleftrightarrow{T} - \varepsilon_0 \mu_0 \frac{\partial \vec{S}}{\partial t} \qquad (9)$$

$$\vec{F} = \oint \overleftrightarrow{T} \cdot d\vec{s} - \varepsilon_0 \mu_0 \frac{d}{dt} \int \vec{S} \, d^3 r$$