

$$\rho(\mathbf{r}) = \sum_{\alpha} q_{\alpha} \delta^{(3)}(\mathbf{r} - \mathbf{r}_{\alpha}) \quad (1)$$

$$\nabla \cdot \vec{j} + \frac{\partial \rho}{\partial t} = 0 \quad (2)$$

$$\begin{aligned} \mathbf{F} &= q(\mathbf{E} + \mathbf{v} \times \mathbf{B}) \\ \mathbf{F} &= \int \rho d^3r (\mathbf{E} + \mathbf{v} \times \mathbf{B}) \\ &= \int (\rho \mathbf{E} + \mathbf{j} \times \mathbf{B}) d^3r \end{aligned} \quad (3)$$

$$\mathbf{p} = \int_V \rho(\mathbf{r}) \mathbf{r} dV \quad (4)$$

$$\phi = \frac{1}{4\pi\epsilon_0} \int_V \frac{\rho(\mathbf{r}')}{|\mathbf{r} - \mathbf{r}'|} dV' \quad (5)$$

$$\phi = \frac{1}{4\pi\epsilon_0} \left[\frac{Q}{r} + \frac{\mathbf{r} \cdot \mathbf{p}}{r^3} + \frac{x_i D_{ij} x_j}{2r^5} \right] \quad (6)$$

$$\mathbf{E}(\mathbf{r}) = \frac{1}{4\pi\epsilon_0} \int \frac{\rho(\mathbf{r}') d^3r'}{|\mathbf{r} - \mathbf{r}'|} (\mathbf{r} - \mathbf{r}') \quad (7)$$

$$\begin{aligned} D_{ij} &= \int \rho(\mathbf{r}) (3x_i x_j - \delta_{ij} r^2) dV \\ D_{ij} &= \sum_{\alpha} q_{\alpha} (3x_i^{(\alpha)} x_j^{(\alpha)} - \delta_{ij} (r^{(\alpha)})^2); \quad \text{Tr } \hat{D} = 0 \end{aligned} \quad (8)$$

$$\mathbf{E} = -\nabla \phi \quad (9)$$

$$\mathbf{j} = \rho \mathbf{v} \quad (10)$$

$$\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \int \frac{\mathbf{j}(\mathbf{r}')}{|\mathbf{r} - \mathbf{r}'|} dV' \quad (11)$$

$$\mathbf{A}(\mathbf{r}) = \frac{\mu_0}{4\pi} \frac{\mathbf{m} \times \mathbf{r}}{r^3} \quad (12)$$

$$\mathbf{m}(\mathbf{r}) = \frac{1}{2} \int \mathbf{r} \times \mathbf{j}(\mathbf{r}) dV \quad (13)$$

$$\mathbf{B}(\mathbf{r}) = \nabla \times \mathbf{A} = \frac{\mu_0}{4\pi} \int \frac{\mathbf{j}(\mathbf{r}') \times (\mathbf{r} - \mathbf{r}')}{|\mathbf{r} - \mathbf{r}'|^3} dV' \quad (14)$$

$$\mathbf{E} = \frac{\partial \mathbf{A}}{\partial t} - \nabla \phi \quad (15)$$

$$\begin{aligned} \nabla \cdot \mathbf{A} + \frac{1}{c^2} \frac{\partial \phi}{\partial t} &= 0 \\ \nabla^2 \phi - \frac{1}{c^2} \frac{\partial^2 \phi}{\partial t^2} &= -\frac{\rho}{\epsilon_0} \end{aligned} \quad (16)$$

$$\nabla^2 \mathbf{A} - \frac{1}{c^2} \frac{\partial^2 \mathbf{A}}{\partial t^2} = -\mu_0 \mathbf{j} \quad (17)$$

$$\langle \rho \rangle = \frac{1}{T} \int_0^T \rho dt \quad (17)$$

$$\nabla^2 \phi - \frac{1}{c^2} \frac{\partial^2 \phi}{\partial t^2} = -\frac{1}{\epsilon_0} \rho \quad (18)$$

$$\nabla^2 \mathbf{A} - \frac{1}{c^2} \frac{\partial^2 \mathbf{A}}{\partial t^2} = -\mu_0 \mathbf{j} \quad (19)$$

$$\begin{aligned} D_{2n} - D_{1n} &= \sigma \\ B_{2n} - B_{1n} &= 0 \\ P_{2n} - P_{1n} &= -\sigma_{vez} \\ E_{2n} - E_{1n} &= \frac{1}{\epsilon_0} \sigma \\ E_{2t} - E_{1t} &= 0 \\ \mathbf{n} \times (\mathbf{H}_2 - \mathbf{H}_1) &= \mathbf{i} \\ M_{2t} - M_{1t} &= \mathbf{i}_{vez} \times \mathbf{n} \end{aligned} \quad (20)$$

$$\begin{aligned} \nabla \cdot \vec{E} &= \frac{\rho}{\epsilon_0} \\ \nabla \cdot \vec{B} &= 0 \\ \nabla \times \mathbf{E} &= -\frac{\partial \mathbf{B}}{\partial t} \\ \nabla \times \mathbf{B} &= \mu_0 \left(\mathbf{j} + \epsilon_0 \frac{\partial \mathbf{E}}{\partial t} \right) \end{aligned} \quad (21)$$

$$\nabla \cdot \vec{D} = \rho + \rho_{ext}$$

$$\nabla \cdot \vec{B} = 0$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t} \quad (22)$$

$$\nabla \times \mathbf{H} = \mathbf{j} + \mathbf{j}_{ext} + \frac{\partial \mathbf{D}}{\partial t}$$

$$q = UC = U\epsilon_0 \frac{S}{d} \quad (23)$$

$$\frac{d}{dt} \left(\sum_n \varepsilon_n + \underbrace{\int_V d^3r \left(\frac{1}{2} \mathbf{D} \cdot \mathbf{E} + \frac{1}{2} \mathbf{H} \cdot \mathbf{B} \right)}_{W_{em}} \right) \quad (24)$$

$$= - \oint_{\partial S} \mathbf{S}_p d\mathbf{S}$$

$$\frac{d}{dt} (\sum_n \varepsilon_n) = \int d^3r \mathbf{j} \cdot \mathbf{E}$$

$$\begin{aligned} \mathbf{S}_p &= \mathbf{E} \times \mathbf{H} \\ \mathbf{g} &= \frac{\mathbf{S}_p}{c^2} \quad \text{- gustina impulsa} \end{aligned} \quad (25)$$

$$\mathbf{L} = \int \mathbf{r} \times \mathbf{g} dV \quad (26)$$

$$\begin{aligned} &\frac{d}{dt} \left[\sum_{\alpha} \mathbf{p}_{\alpha} + \int d^3r (\mathbf{D} \times \mathbf{B}) \right] \\ &- \frac{1}{2} \int d^3r (\epsilon_0 \mathbf{E}^2 \nabla \epsilon_r + \mu_0 \mathbf{H}^2 \nabla \mu_r) = \oint_S \hat{T} d\mathbf{S} \\ &\hat{T} = |\mathbf{E}| \langle \mathbf{D} | + |\mathbf{B}| \langle \mathbf{H} | - \frac{1}{2} (\mathbf{E} \cdot \mathbf{D} + \mathbf{H} \cdot \mathbf{B}) I \end{aligned} \quad (27)$$

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