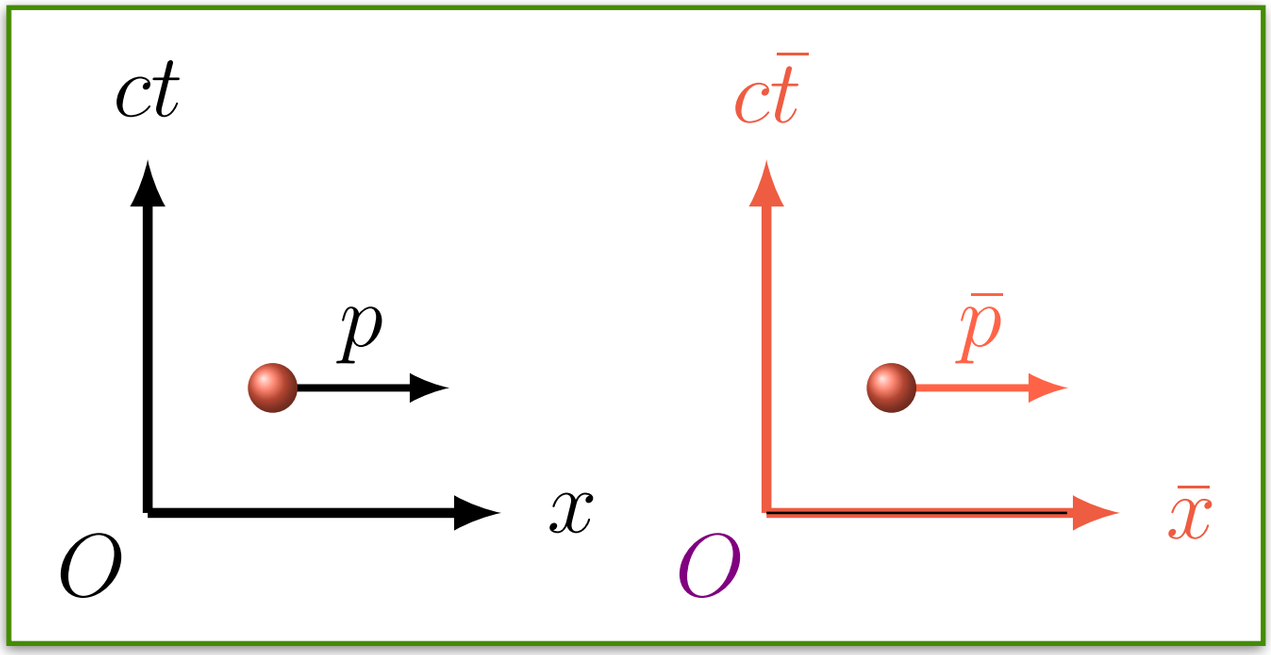
Eletromagnetismo Avançado

27 de outubro
Relatividade restrita

Momento

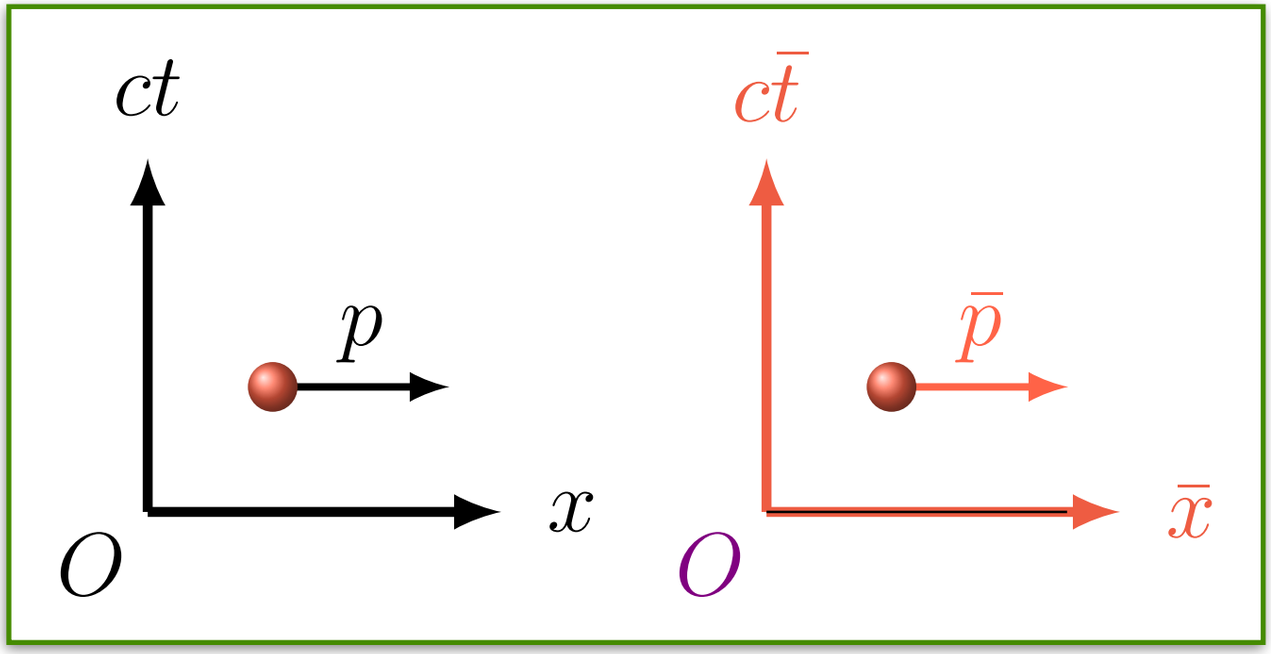
$$p^\mu = m\eta^\mu$$



Momento

$$p^\mu = m\eta^\mu$$

Garante conservação do momento e da energia



Momento

$$p^\mu = m\eta^\mu$$

$$p^\mu = \frac{1}{\sqrt{1-\dfrac{u^2}{c^2}}}\begin{bmatrix} mc \\ mu^1 \\ mu^2 \\ mu^3 \end{bmatrix}$$

$$E = \frac{mc^2}{\sqrt{1-\dfrac{u^2}{c^2}}}$$

$$\vec{\mathbf{p}} = \frac{m\vec{\mathbf{u}}}{\sqrt{1-\dfrac{u^2}{c^2}}}$$

Momento

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$$p^\mu = \frac{1}{\sqrt{1 - \dfrac{u^2}{c^2}}} \begin{bmatrix} mc \\ mu^1 \\ mu^2 \\ mu^3 \end{bmatrix}$$

$$p^\mu p_\mu = -m^2 c^2$$

Momento

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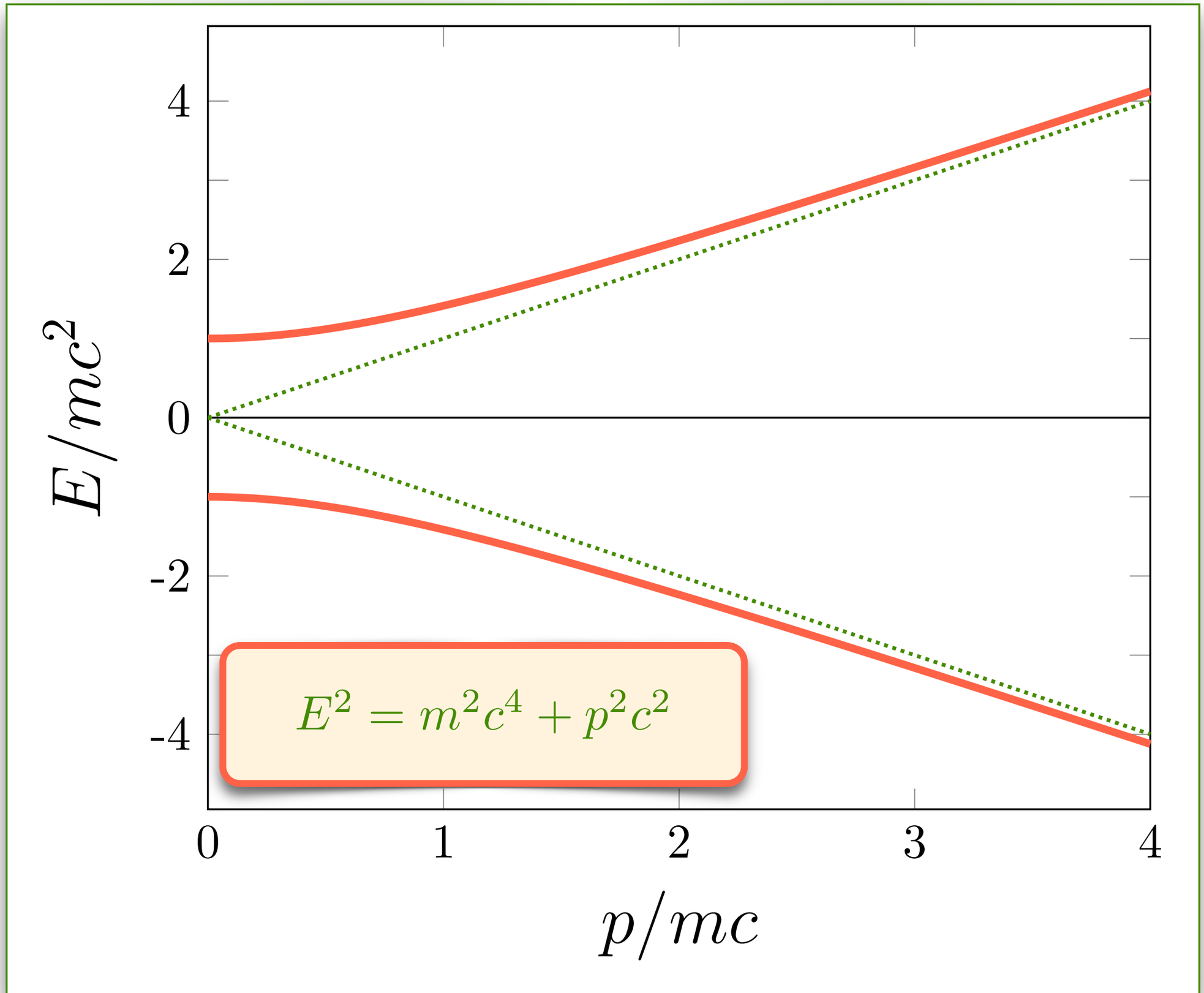
$$p^\mu p_\mu = -m^2c^2$$

$$p^\mu p_\mu = -\frac{E^2}{c^2} + p^2$$

$$E^2 = m^2c^4 + p^2c^2$$

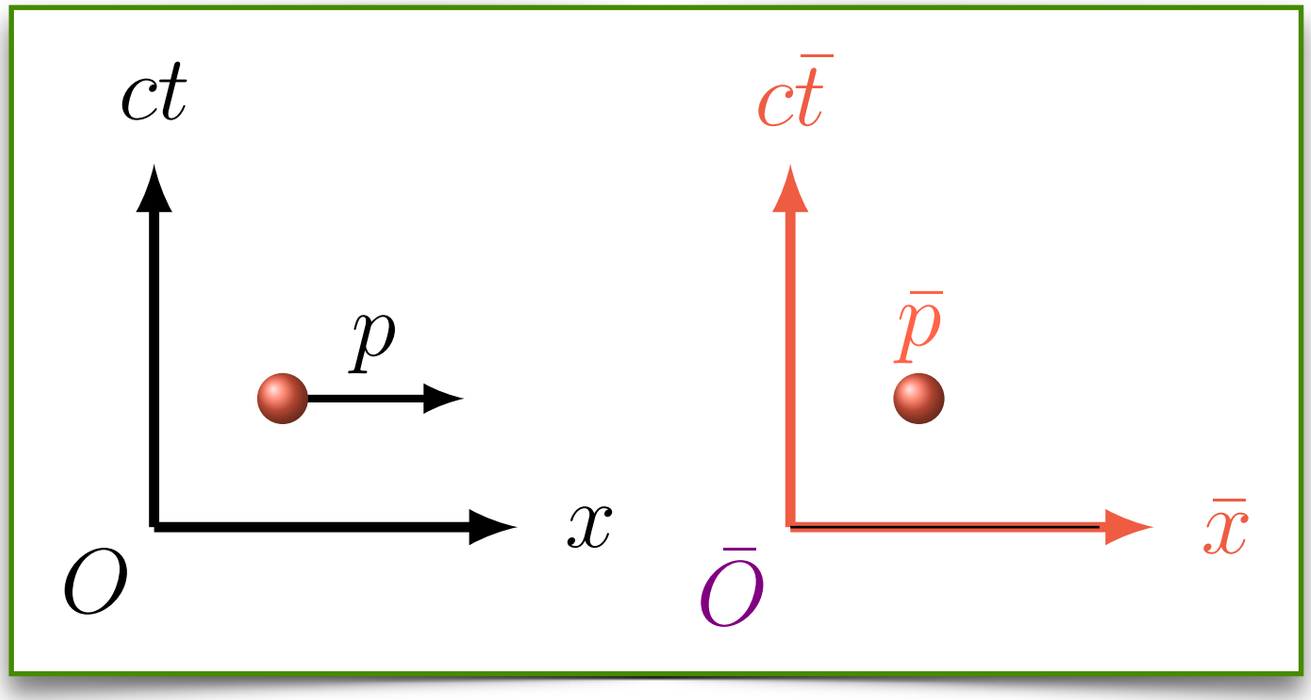
Momento



Densidade de corrente

$$p^\mu = m\eta^\mu$$

$$p^\mu = \frac{m}{\sqrt{1 - \dfrac{u^2}{c^2}}} \begin{bmatrix} c \\ u^1 \\ u^2 \\ u^3 \end{bmatrix}$$

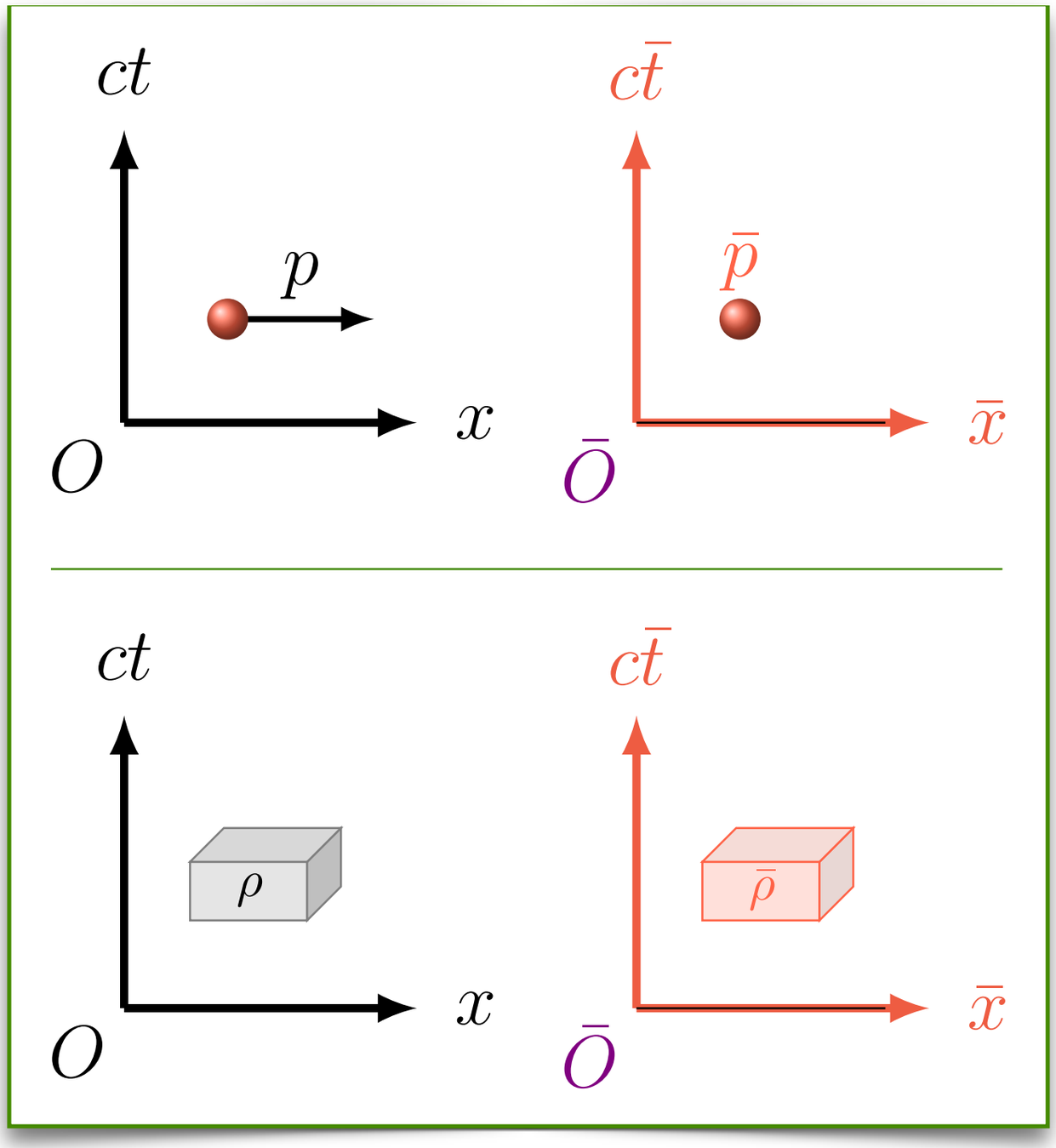


Densidade de corrente

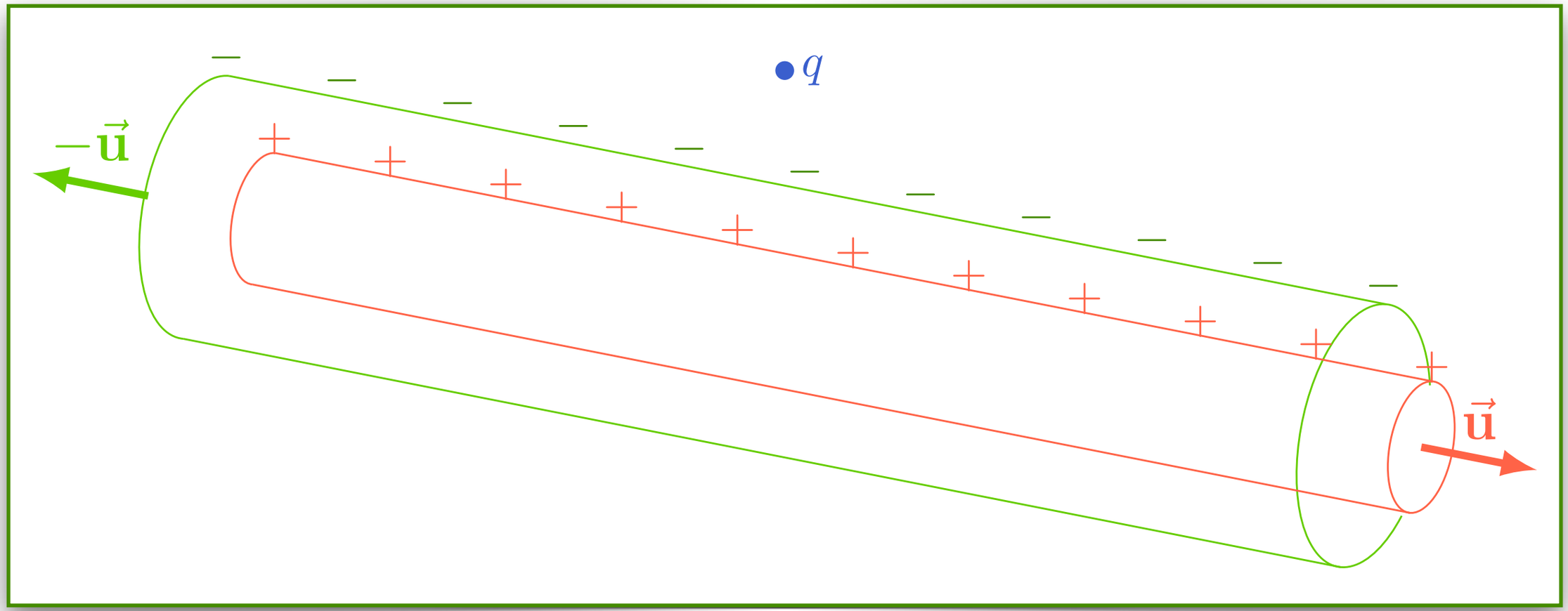
$$p^\mu = m\eta^\mu$$

$$J^\mu = \rho\eta^\mu$$

$$J^\mu = \frac{\rho}{\sqrt{1-\dfrac{u^2}{c^2}}}\begin{bmatrix} c \\ u^1 \\ u^2 \\ u^3 \end{bmatrix}$$



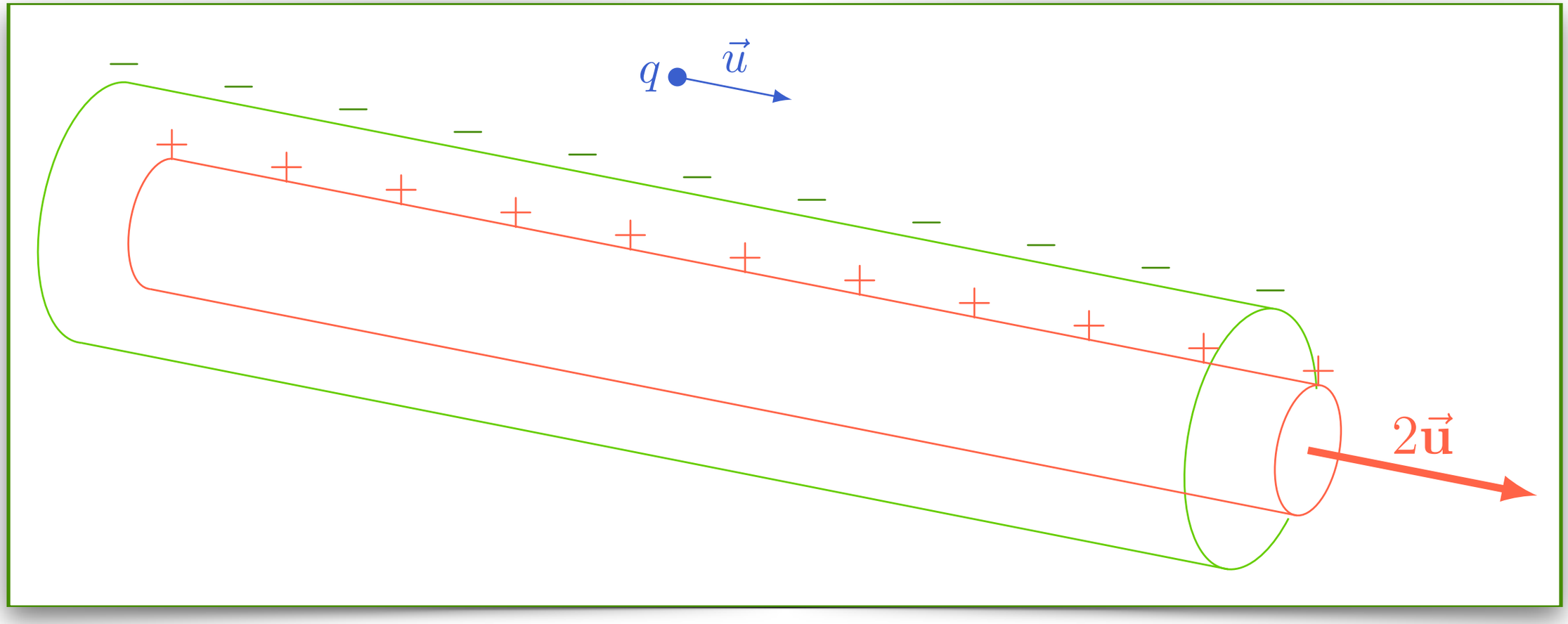
Eletromagnetismo e relatividade



Referencial de laboratório $\Rightarrow \vec{v}_q = 0$

$$J^\mu = \frac{\rho}{\sqrt{1-\frac{u^2}{c^2}}} \begin{bmatrix} c \\ u^1 \\ u^2 \\ u^3 \end{bmatrix}$$

Eletromagnetismo e relatividade



Referencial móvel $\vec{v} = -\vec{u} \Rightarrow \vec{v}_q = \vec{u}$

$$J^{\mu} = \frac{\rho}{\sqrt{1 - \frac{u^2}{c^2}}} \begin{bmatrix} c \\ u^1 \\ u^2 \\ u^3 \end{bmatrix}$$

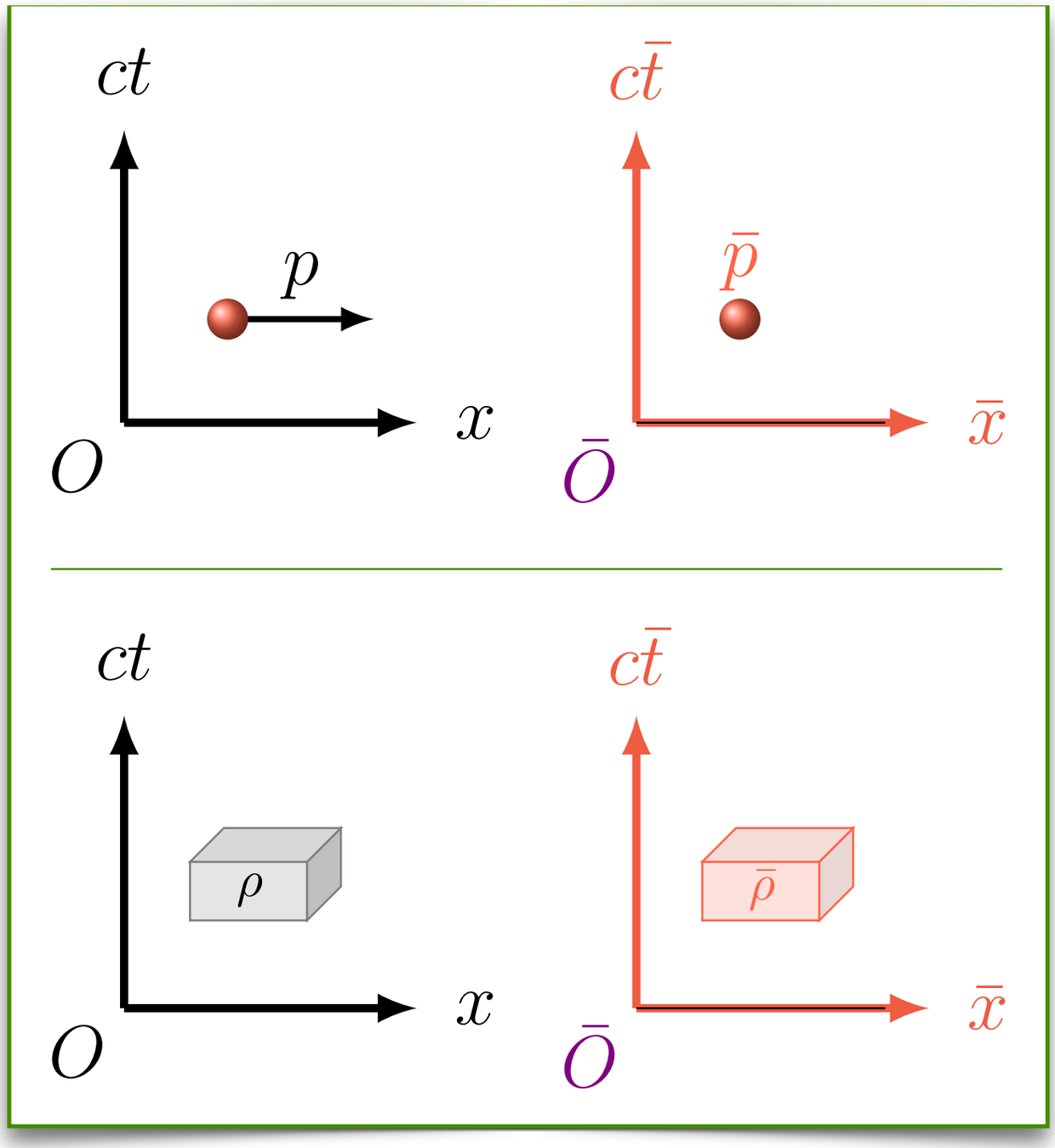
Densidade de corrente

$$p^\mu = m\eta^\mu$$

$$J^\mu = \rho\eta^\mu$$

$$J^\mu = \frac{\rho}{\sqrt{1 - \dfrac{u^2}{c^2}}} \begin{bmatrix} c \\ u^1 \\ u^2 \\ u^3 \end{bmatrix}$$

$$J^\mu J_\mu = -\rho^2 c^2$$



Densidade de corrente

$$p^\mu = m\eta^\mu$$

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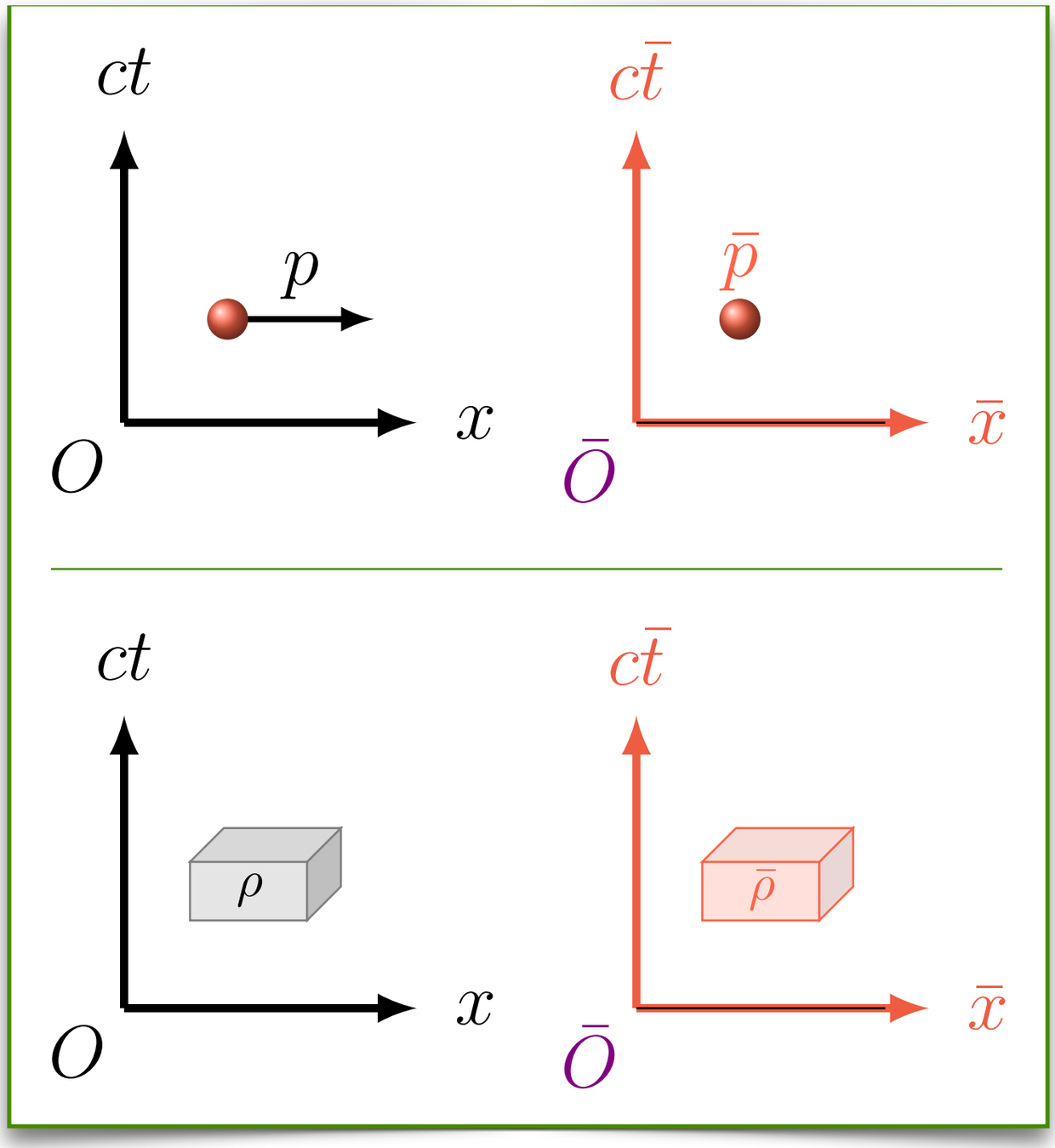
$$J^\mu = \frac{\rho}{\sqrt{1 - \dfrac{u^2}{c^2}}} \begin{bmatrix} c \\ u^1 \\ u^2 \\ u^3 \end{bmatrix}$$

$$\partial_\mu J^\mu = 0$$



Potenciais e relatividade

$$p^\mu = \frac{1}{\sqrt{1-\frac{u^2}{c^2}}}\begin{bmatrix} E/c \\ p^1 \\ p^2 \\ p^3 \end{bmatrix} \Rightarrow A^\mu = \frac{1}{\sqrt{1-\frac{u^2}{c^2}}}\begin{bmatrix} V/c \\ A^1 \\ A^2 \\ A^3 \end{bmatrix}$$

Potenciais e relatividade

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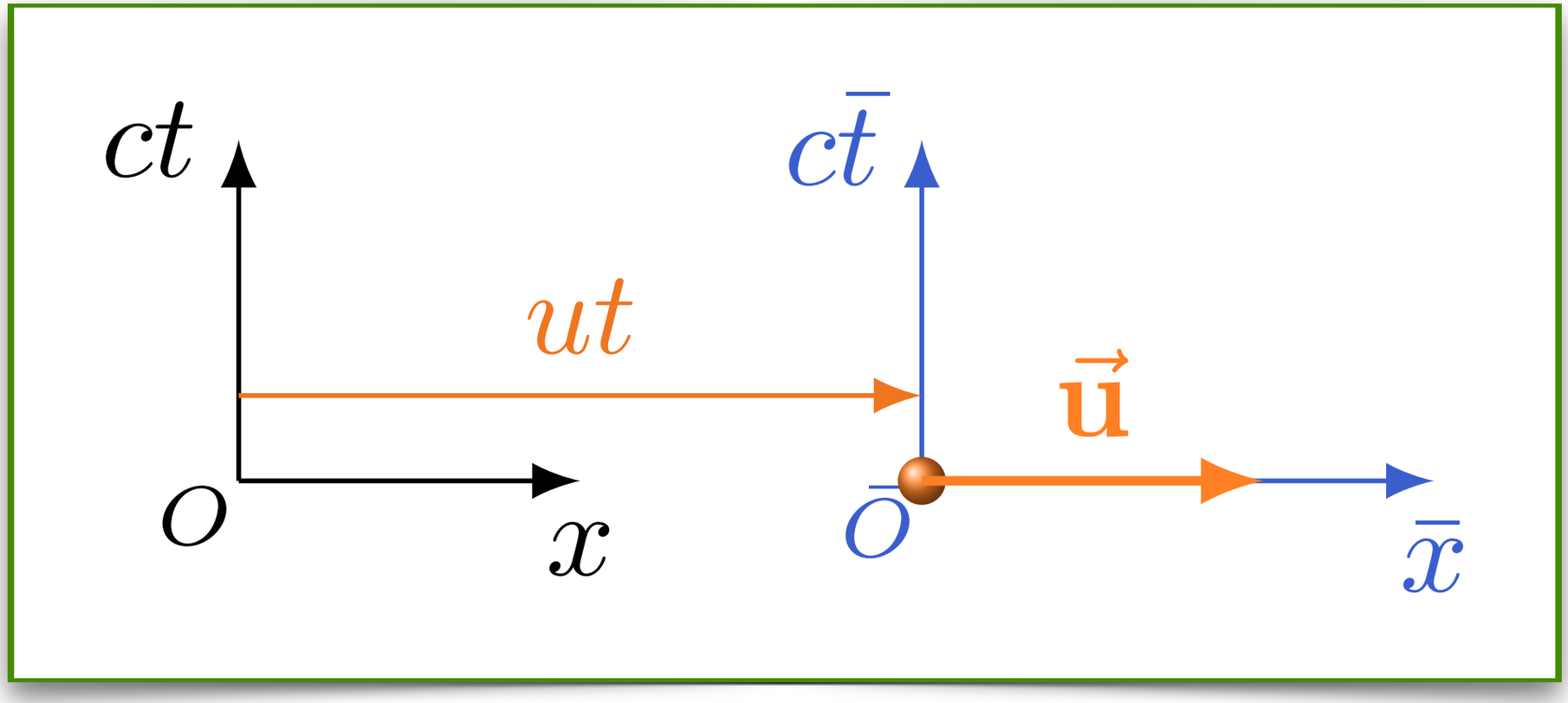

Potenciais e relatividade

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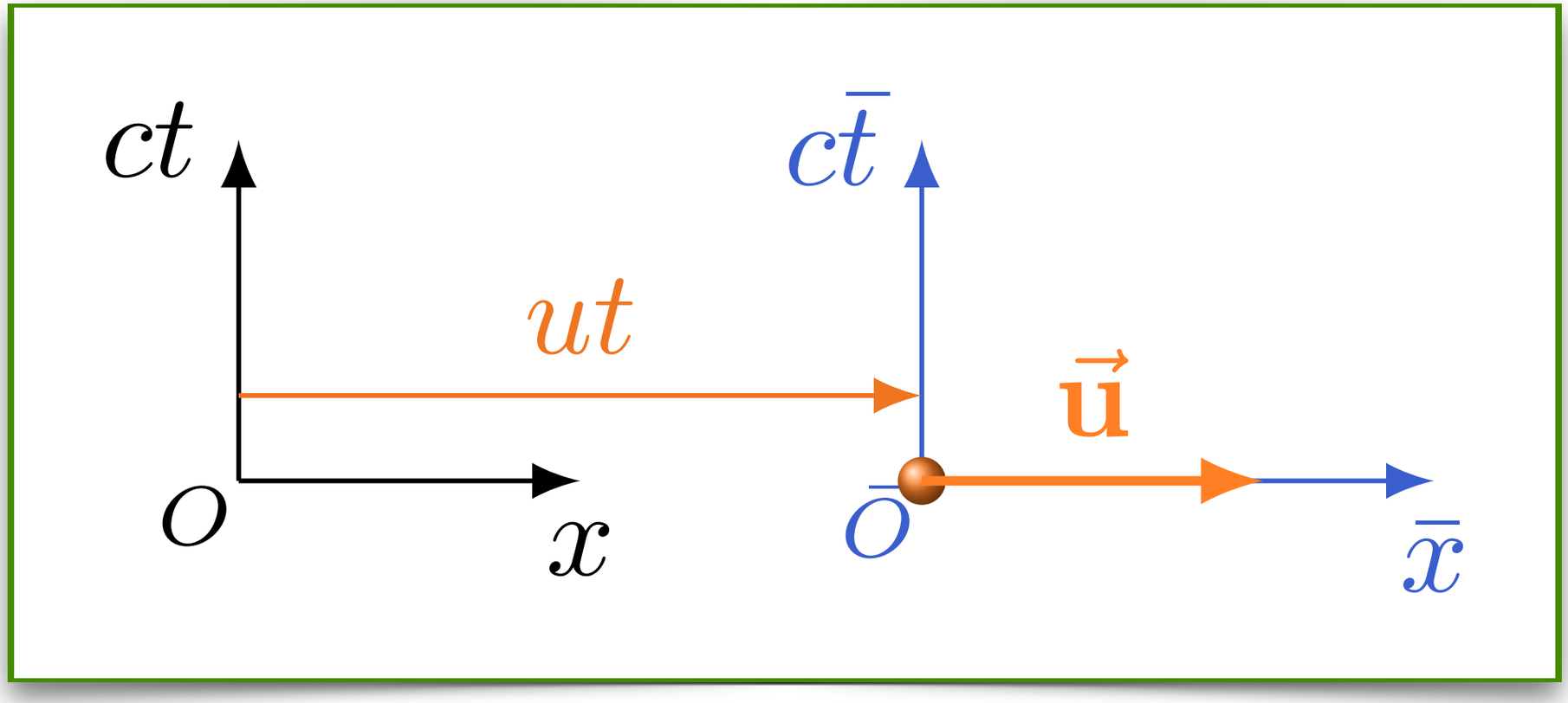
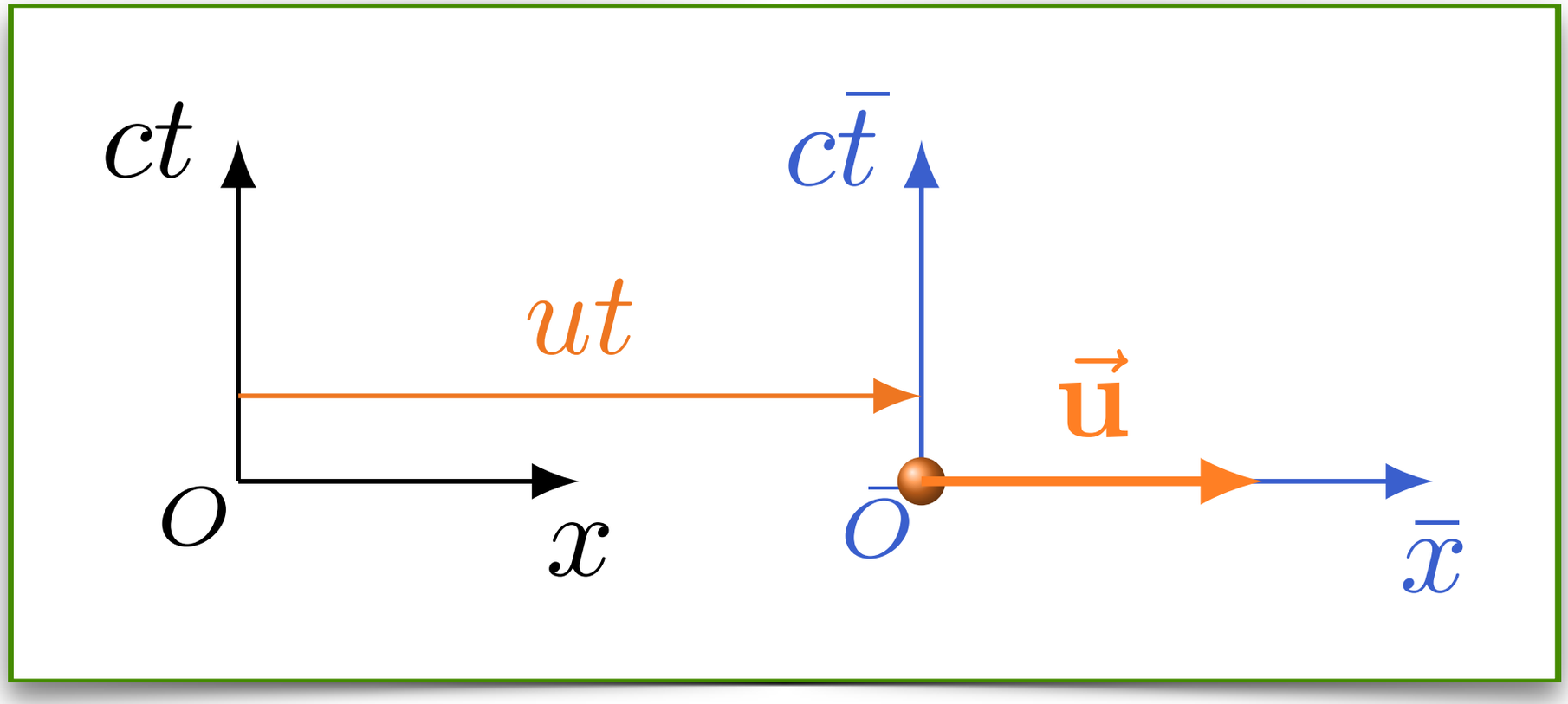


$$A^\mu A_\mu = -V^2/c^2$$

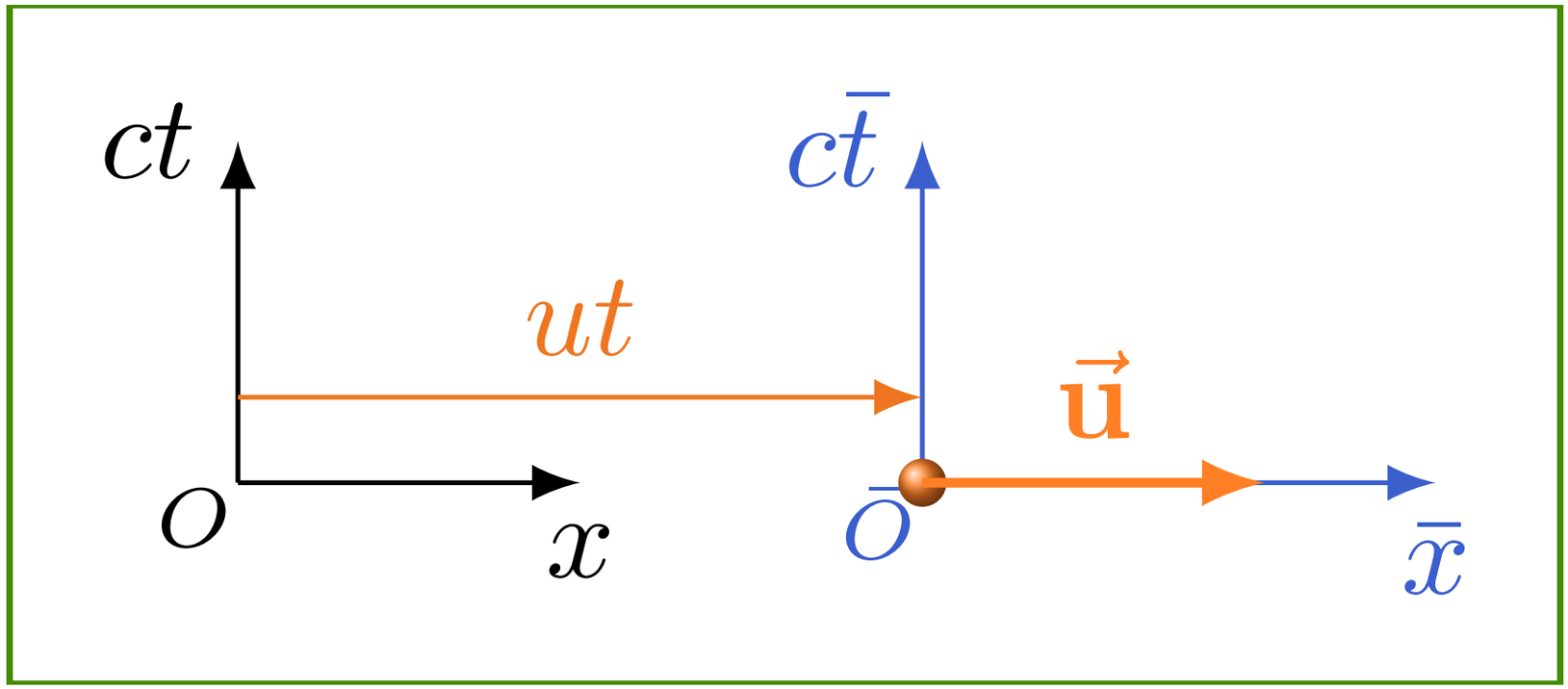
Potenciais e relatividade



$$\bar{V} = \frac{q}{4\pi\epsilon_0 r}$$

$$\vec{\bar{\mathbf{A}}} = 0$$

Potenciais e relatividade



$$\bar{V} = \frac{q}{4\pi\epsilon_0 r}$$

$$\vec{\bar{A}} = 0$$