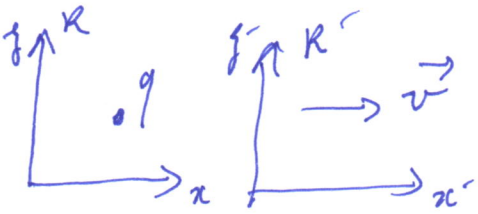
Exo 3 Paradoxe électromagnétique.

$$F'^{\mu\nu} = \Lambda^{\mu}_{\ \beta}\,\Lambda^{\nu}_{\ \alpha}\,F^{\alpha\beta}$$
$$= \Lambda F \Lambda^{T}$$



$$F\Lambda^{T} = \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & -B_y & 0 \\ 0 & B_y & 0 & -B_x \\ 0 & 0 & B_x & 0 \end{pmatrix} \begin{pmatrix} \gamma & -\beta\gamma & 0 & 0 \\ -\beta\gamma & \gamma & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$= \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & -B_y & 0 \\ -\beta\gamma B_y & \gamma B_y & 0 & -B_x \\ 0 & 0 & B_x & 0 \end{pmatrix} = (T)$$

$$\Lambda T = \begin{pmatrix} \gamma & -\beta\gamma & 0 & 0 \\ -\beta\gamma & \gamma & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & -B_y & 0 \\ -\beta\gamma B_y & \gamma B_y & 0 & -B_x \\ 0 & 0 & B_x & 0 \end{pmatrix}$$

$$= \begin{pmatrix} 0 & 0 & \beta\gamma B_y & 0 \\ 0 & 0 & -\gamma B_y & 0 \\ -\beta\gamma B_y & \gamma B_y & 0 & -B_x \\ 0 & 0 & B_x & 0 \end{pmatrix} = F'^{\mu\nu}$$

$$\rightarrow E'_y = -\beta\gamma c B_y \qquad B'_y = \gamma B_y \qquad B'_x = B_x$$

$$\vec{F}' = q(\vec{E}' + \vec{v} \wedge \vec{B}') = +q\left[-\beta\gamma c B_y \vec{e}_y + (-v\vec{e}_x) \wedge (\gamma B_y \vec{e}_y + B_x \vec{e}_z)\right]$$
$$= -q\beta\gamma c B_y \vec{e}_y + q\gamma v B_y \vec{e}_y = \vec{0}$$