Pressione di radiazione

dalla forza (per unità di volume): $\boldsymbol{f} = \rho \boldsymbol{E} + \frac{1}{c} \boldsymbol{j} \times \boldsymbol{B}$

$$\begin{aligned}
\boldsymbol{f} &= \frac{1}{4\pi} \left\{ (\boldsymbol{\nabla} \cdot \boldsymbol{E})\boldsymbol{E} + \left(\boldsymbol{\nabla} \times \boldsymbol{B} - \frac{1}{c}\frac{\partial \boldsymbol{E}}{\partial t} \right) \times \boldsymbol{B} \right\} \\
&= \frac{1}{4\pi} \left\{ (\boldsymbol{\nabla} \cdot \boldsymbol{E})\boldsymbol{E} + (\boldsymbol{\nabla} \cdot \boldsymbol{B})\boldsymbol{B} + (\boldsymbol{\nabla} \times \boldsymbol{B}) \times \boldsymbol{B} - \frac{1}{c}\frac{\partial}{\partial t}(\boldsymbol{E} \times \boldsymbol{B}) \right. \\
&\qquad \left. + \frac{1}{c} \boldsymbol{E} \times \frac{\partial \boldsymbol{B}}{\partial t} \right\} \\
&= \frac{1}{4\pi} \left\{ (\boldsymbol{\nabla} \cdot \boldsymbol{E})\boldsymbol{E} + (\boldsymbol{\nabla} \cdot \boldsymbol{B})\boldsymbol{B} + (\boldsymbol{\nabla} \times \boldsymbol{B}) \times \boldsymbol{B} + (\boldsymbol{\nabla} \times \boldsymbol{E}) \times \boldsymbol{E} \right. \\
&\qquad \left. - \frac{1}{c}\frac{\partial}{\partial t}(\boldsymbol{E} \times \boldsymbol{B}) \right\}
\end{aligned}$$

forza media sulla parete $\perp$ all'asse x

$$\begin{aligned}
\overline{f}_x &= \frac{1}{4\pi} \left\{ \frac{1}{2}\frac{\partial \overline{E}_x^2}{\partial x} + \frac{1}{2}\frac{\partial \overline{B}_x^2}{\partial x} - \frac{1}{2}\frac{\partial \overline{B}_z^2}{\partial x} - \frac{1}{2}\frac{\partial \overline{B}_y^2}{\partial x} - \frac{1}{2}\frac{\partial \overline{E}_z^2}{\partial x} - \frac{1}{2}\frac{\partial \overline{E}_y^2}{\partial x} \right\} \\
&= \frac{1}{4\pi} \left\{ \frac{\partial \overline{E}_x^2}{\partial x} + \frac{\partial \overline{B}_x^2}{\partial x} - \frac{1}{2}\frac{\partial}{\partial x} \left(\overline{E}^2 + \overline{B}^2 \right) \right\} \\
&= \frac{1}{4\pi}\frac{\partial}{\partial x} \left\{ \frac{1}{3} \left(\overline{E}^2 + \overline{B}^2 \right) - \frac{1}{2} \left(\overline{E}^2 + \overline{B}^2 \right) \right\} \\
&= -\frac{1}{3}\frac{\partial}{\partial x} \left\{ \frac{1}{8\pi} \left(\overline{E}^2 + \overline{B}^2 \right) \right\} \\
&= -\frac{1}{3}\frac{\partial U}{\partial x}
\end{aligned}$$

$\Rightarrow$ pressione $\boxed{p = \int \overline{f}_x \, dx = \frac{1}{3} U}$