A laser beam has a cross section A_1 and a power P_1.

Laser: P_1, A_1
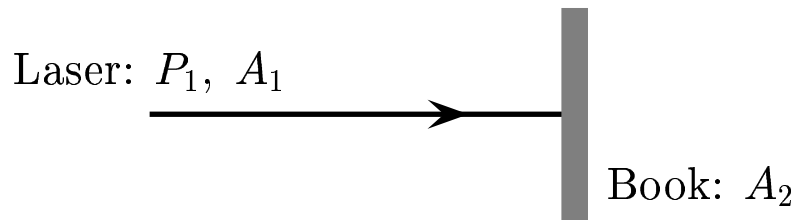
Book: A_2

Find the maximum electric field, E_{max} of the laser beam. Assume the area of the book is $A_2 = 1000 A_1$ and $\dfrac{3}{4}$ of the light is reflected by the book.

A) $E_{max} = \sqrt{\dfrac{2\,c\,\mu_0\,P_1}{A_1}}$

B) $E_{max} = \sqrt{\dfrac{2\,c\,\mu_0\,P_1}{A_2}}$

C) $E_{max} = \sqrt{\dfrac{c\,\mu_0\,P_1}{A_1}}$

D) $E_{max} = \sqrt{\dfrac{c\,\mu_0\,P_1}{A_2}}$

Recall: $\vec{S} = \dfrac{1}{\mu_0}\,\vec{E}\times\vec{B}$; $E = cB$; $I = S_{av} = c\,u_{av} = \dfrac{\text{power}}{A}$;

Therefore $\dfrac{P_1}{A_1} = S_{av} = \dfrac{1}{2\,\mu_0}\,E_{max}\,B_{max} = \dfrac{E_{max}^2}{2\,c\,\mu_0}$.

Solving for E_{max}, we have $E_{max} = \sqrt{\dfrac{2\,c\,\mu_0\,P_1}{A_1}}$.

Answer **A**.

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