A straight long wire of resistance $R$, radius $a$ and length $L$. It carries a constant current $I$.

\[ X \]

$\vec{I}$

$L$

Determine the direction of the Poynting vector $\vec{S}$ at $X$.

A) The direction of $\vec{S}$ is $\leftarrow$.
B) The direction of $\vec{S}$ is $\uparrow$.
C) The direction of $\vec{S}$ is $\rightarrow$.
D) The direction of $\vec{S}$ is $\downarrow$.

$\vec{E}$ is along the direction of $I$. At $X$, using the right-hand-rule, one finds that $\vec{B}$ is pointing out of the paper. Thus $\vec{S} = \frac{1}{\mu_0} \vec{E} \times \vec{B}$, and it is pointing downward, or pointing radially inward.

Answer D.

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