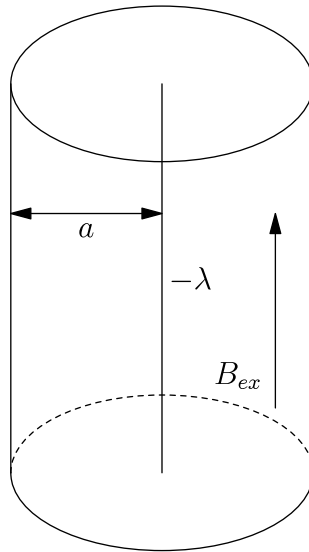


J02E.2—Rotating Dielectric Cylinder

Problem

An infinitely long wire with linear charge density $-\lambda$ lies along the z axis. An insulating cylindrical shell of radius a and moment of inertia I per unit length is concentric with the wire, and can rotate freely about the z axis. The areal charge density on the cylinder is $\sigma = \lambda/2\pi a$ and is uniformly distributed.



The cylinder is immersed in an external magnetic field $B_{ex}\hat{\mathbf{z}}$, and is initially at rest.

Starting at $t = 0$ the external magnetic field is slowly reduced to zero over a time $T \gg a/c$, where c is the speed of light. What is the final angular velocity ω of the cylinder?