

ALTERNATING CURRENT

Link to: [physicspages home page](#).

To leave a comment or report an error, please use the auxiliary blog.

References: Griffiths, David J. (2007), Introduction to Electrodynamics, 3rd Edition; Pearson Education - Problem 7.10.

The alternating current common in households can be generated by rotating a loop of wire in a constant magnetic field. Suppose we have a square loop of side length a rotating at a constant angular velocity ω within a constant magnetic field \mathbf{B} which is perpendicular to ω . Then the magnetic flux is given by

$$\Phi(t) = \int \mathbf{B} \cdot d\mathbf{a} = Ba^2 \cos \omega t$$

The emf is then

$$\mathcal{E} = -\frac{d\Phi}{dt} = \omega Ba^2 \sin \omega t$$

The emf thus alternates between positive and negative with period $2\pi/\omega$. A power station uses some external force to rotate the wire and provides the magnetic field, with the result that electricity is generated.