

University of Virginia

Department of Physics

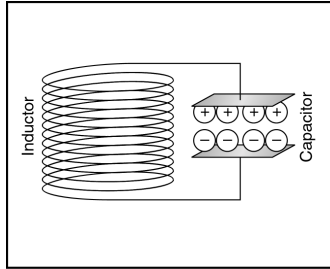
Physics 606: How Things Work II

Lecture #24 Slides:

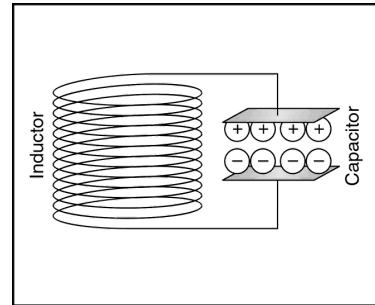
Radios II

Tank Circuit

- Inductor & Capacitor share energy
- Charge flows back and forth through inductor
- Energy shifts back and forth between the two devices



Tank Circuit Oscillation

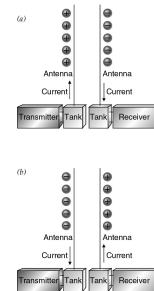


Tank Circuits in Radio

- Tanks are resonant devices
- Tanks build up energy at a specific frequency
- Tanks help radios emit radio waves
- Tanks help radios detect radio waves

Emitting Radio Waves 1

- A transmitter uses a tank circuit to “slosh” charge up and down its antenna
- A receiver uses a tank circuit to detect charge “sloshing” on its antenna
- Transmitter antenna charge affects receiver antenna charge

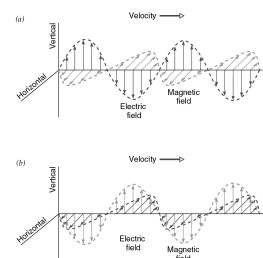


Emitting Radio Waves 2

- Accelerating charge emits radio waves
 - Charge produces electric field
 - Current produces magnetic field
 - Changing current produces changing magnetic field, produces changing electric field, prod...
- A radio wave consists only of an electric and magnetic field
- A radio wave travels through empty space at the speed of light

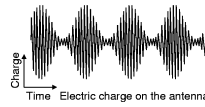
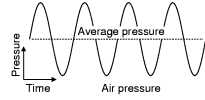
Structure of a Radio Wave

- Electric field is perpendicular to magnetic field
- Electric field creates magnetic field and vice versa
- Electric field determines polarization of the wave



AM Modulation

- Information is encoded in the fluctuating amplitude of the wave
- Pressure variations cause changes in the amount of charge moving on the antenna



FM Modulation

- Information is encoded in the exact frequency of the charge motion
- Pressure variations cause slight shifts in the frequency of charge motion on the antenna

