

Phy212: LECTURE 14.1
AC currents, LRC circuit,
Resonance, Transformer

Reading assignment:
Young&Freedman 31.1-31.6

Terminology

- Alternator (alternating-current generator)
- AC source $v = V \cos \omega t$
- Instantaneous voltage and voltage amplitude
- US/Canada: 60Hz, other countries: 50Hz
- Current: $i = I \cos \omega t$
- I: current amplitude
- Phasor diagram
- Root mean square value (rms) I_{rms} .

Resistor in AC circuit

Inductor in AC circuit

Capacitor in AC circuit

LRC circuits with AC Source

- Equation
- Solution
- Reactance and Impedance
- Power dissipation

Resonance in LRC Circuit

- Plot of $I(\omega)$:
- Two limits: small and large ω
- Resonance frequency:
- Width, peak value, etc.
- Q factor (quality) $Q = \frac{\Delta\omega}{\omega_0}$

Demo: LRC circuit

- Tune ω
- Tune L

Transformer

- Step-up and step-down transformer
- Power: (energy conservation)
- Why do we need to transform up the voltage?

Demo: transformer