# Microwave Engineering

## Unit-3

# Conventional Tubes

- Conventional Device tubes cannot be used for frequencies above 100MHz
- 1. Interelectrode capacitance
- 2. Lead Inductance effect
- 3. Transit time effect
- 4. Gain Bandwidth limitation
- 5. Effect of RF losses (Conductance, dielectric)
- 6. Effect due to radiation losses

- Efficient Microwave tubes usually operate on the theory of electron **velocity modulation** concept
- The electron **transit time** is used in the conversion of dc power to RF power

# Linear Beam O tubes

- The paramount O – type tube is the two cavity klystron followed by the reflex klystron.

- Slow wave structures are also O-type but have non-resonant periodic structures for electron interactions.
- Twystron is a hybrid amplifier which uses a combination of klystron and Slow wave structures.

# KLYSTRON

- There are two basic configurations of klystron tubes
- 1. **Reflex Klystron** used as a low-power Microwave oscillator
- 2. **Multi cavity klystron** used as low-power microwave amplifier

# REFLEX KLYSTRON

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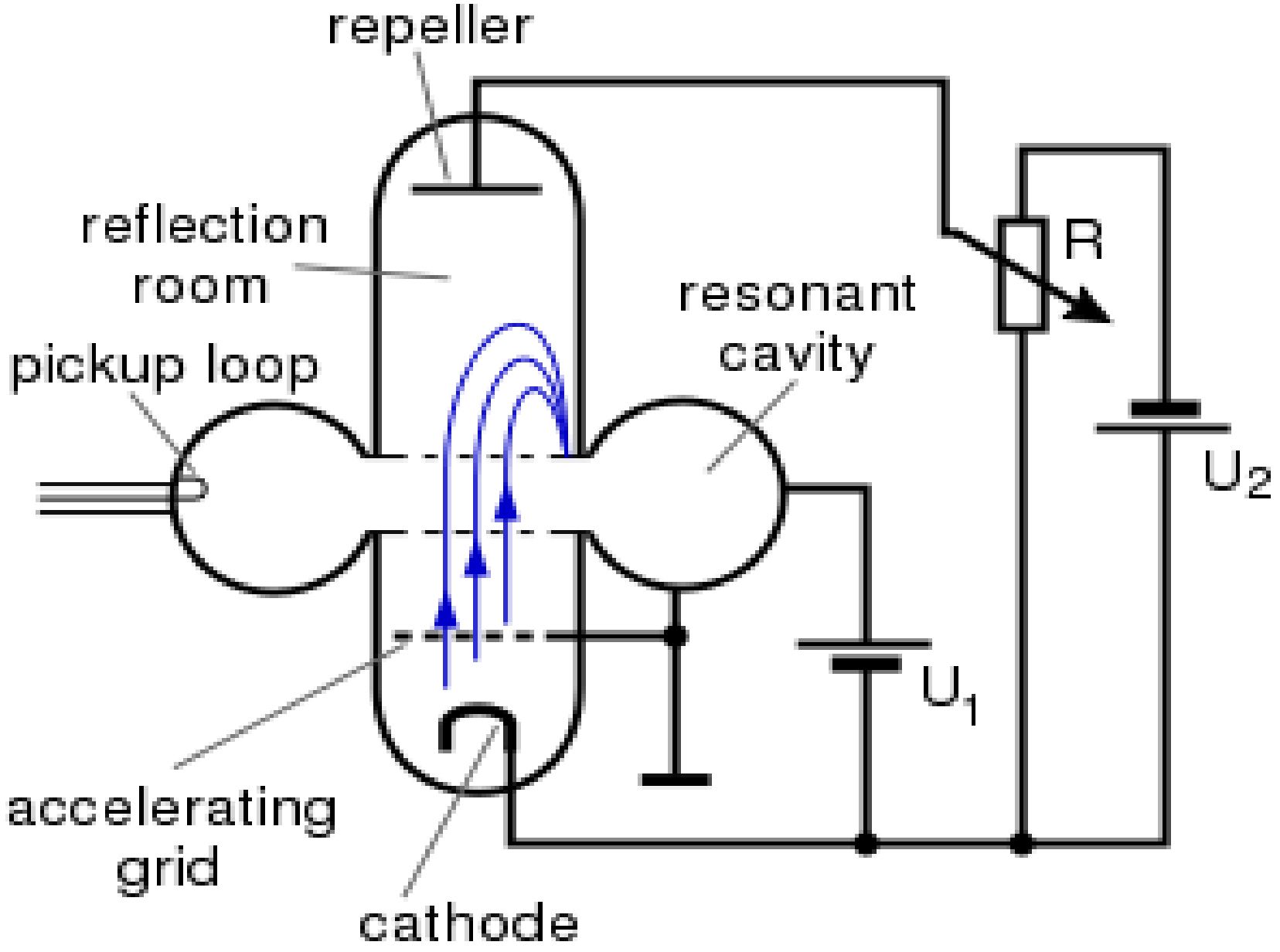

# REFLEX KLYSTRON

- **Single Re-entrant cavity** as a resonator.
- The electron beam **emitted** from the cathode is **accelerated** by the grid and passes through the cavity anode to the repeller space between the cavity anode and the repeller electrode .

- The **feedback** required to maintain the oscillations within the cavity is obtained by **reversing electron beam** emitted from the cathode towards repeller electrode and sending it back through the cavity.

- The electrons in the beam are **velocity modulated before the beam passes through the cavity** the second time and give up the energy to the cavity to maintain oscillations.

- This type of a Klystron is called a **Reflex Klystron** because of the reflex action of the electron beam.