Microwave Engineering

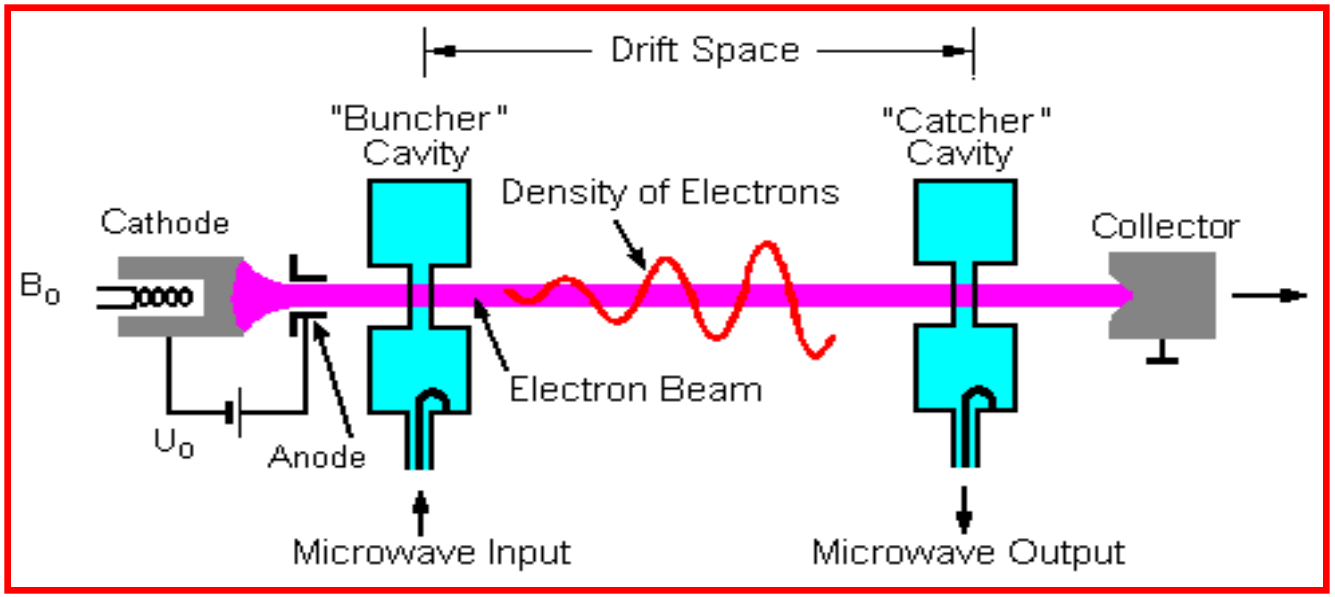
Unit-3

Reentrant Cavity

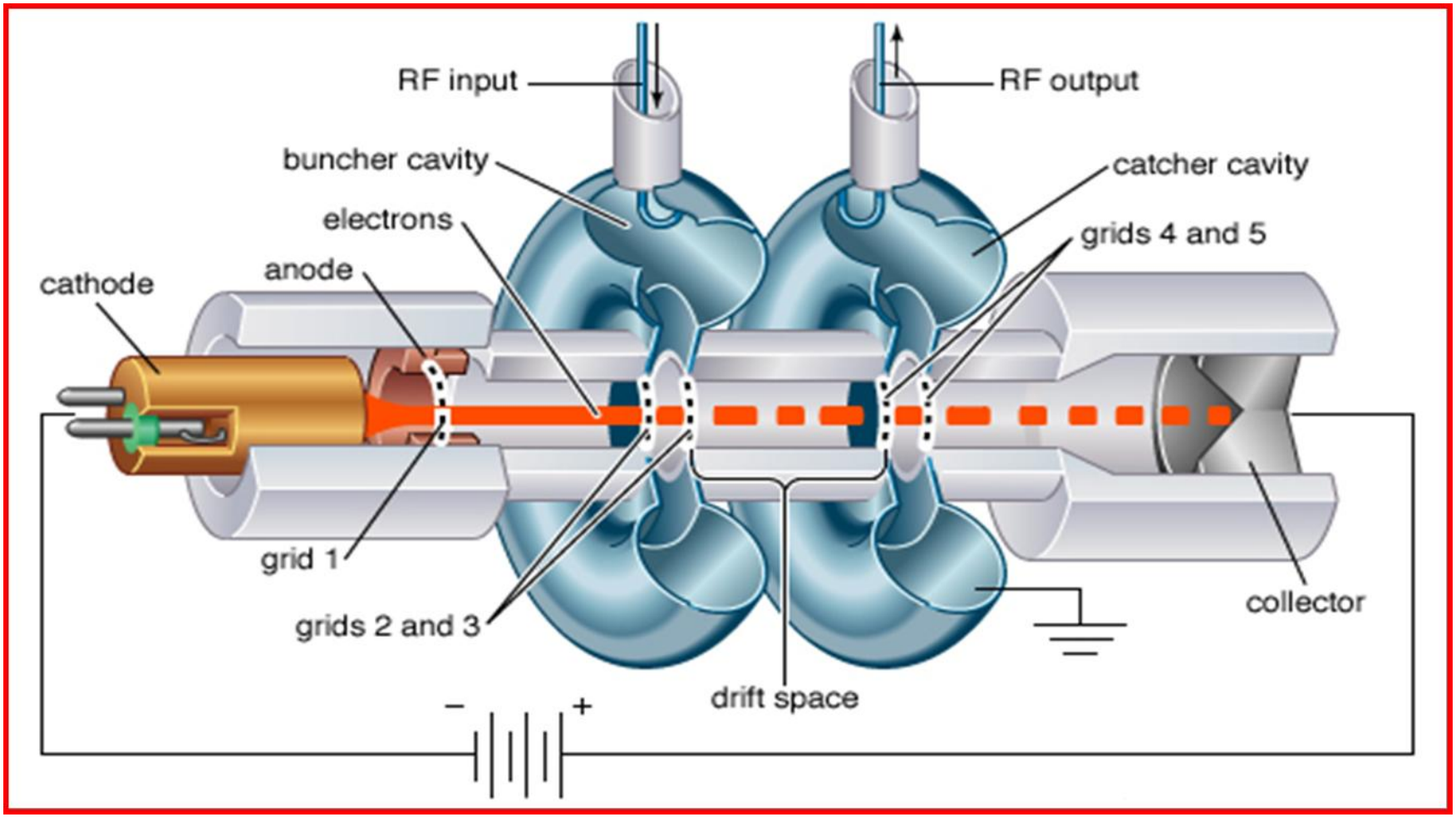
- At a frequency well **below the microwave range**, the cavity resonator can be represented by a **lumped-constant resonant circuit**.
- When the operating frequency is increased to **microwave range**, both the **inductance and capacitance must be reduced to a minimum** in order to maintain resonance at the operating frequency.
- Ultimately the **inductance** is reduced to a minimum by **short wire.**

Klystron Oscillator

A klystron is a vacuum tube that can be used either as a generator or as an amplifier of power, at microwave frequencies.



Two cavity Klystron Amplifier



Applications

- **As power output tubes**
  1. in UHF TV transmitters
  2. in troposphere scatter transmitters
  3. satellite communication ground station
  4. radar transmitters
- **As power oscillator** (5 – 50 GHz), if used as a klystron oscillator

Reflex Klystrons

- The reflex klystron has been the most used source of microwave power in laboratory applications.

Construction

- A reflex klystron consists of an electron gun, a cavity with a pair of grids and a repeller plate as shown in the above diagram.
- In this klystron, a single pair of grids does the functions of both the buncher and the catcher grids.
- The main difference between two cavity reflex klystron amplifier and reflex klystron is that the output cavity is omitted in reflex klystron and the repeller or reflector electrode, placed a very short distance from the single cavity, replaces the collector electrode.

Working

- The cathode emits electrons which are accelerated forward by an accelerating grid with a positive voltage on it and focused into a narrow beam.
- The electrons pass through the cavity and undergo velocity modulation, which produces electron bunching and the beam is repelled back by a repeller plate kept at a negative potential with respect to the cathode.
- On return, the electron beam once again enters the same grids which act as a buncher, therby the same pair of grids acts simultaneously as a buncher for the forward moving electron and as a catcher for the returning beam.