Characteristics:

Freq. range : 1 to 25 GHz

Power output : low-power generator of 10 to 500 mW

Efficiency : About 20 to 30%

Applications:

- Laboratory microwave measurements
- In microwave receivers, as local oscillators in commercial and military applications
- In airborne Doppler radars as well as missiles

Outcome:

Able to analyze the amplification/oscillation process in two cavity and reflex klystron and derive velocity modulation equations.

Traveling-Wave Tube (TWT) Amplifier

Aim:

To understand the need of slow wave structure used in microwave amplifiers & TWT operation.

Objective: To study the construction of TWT Microwave resonators are tunable circuits used in microwave oscillators, amplifiers, wave meters and filters.

TWT - Construction:

It uses a helix slow wave non resonant microwave guiding structure and thus a broadband microwave amplifier.

* Electron beam
* Slow wave structure (structure supporting a slow electromagnetic wave)

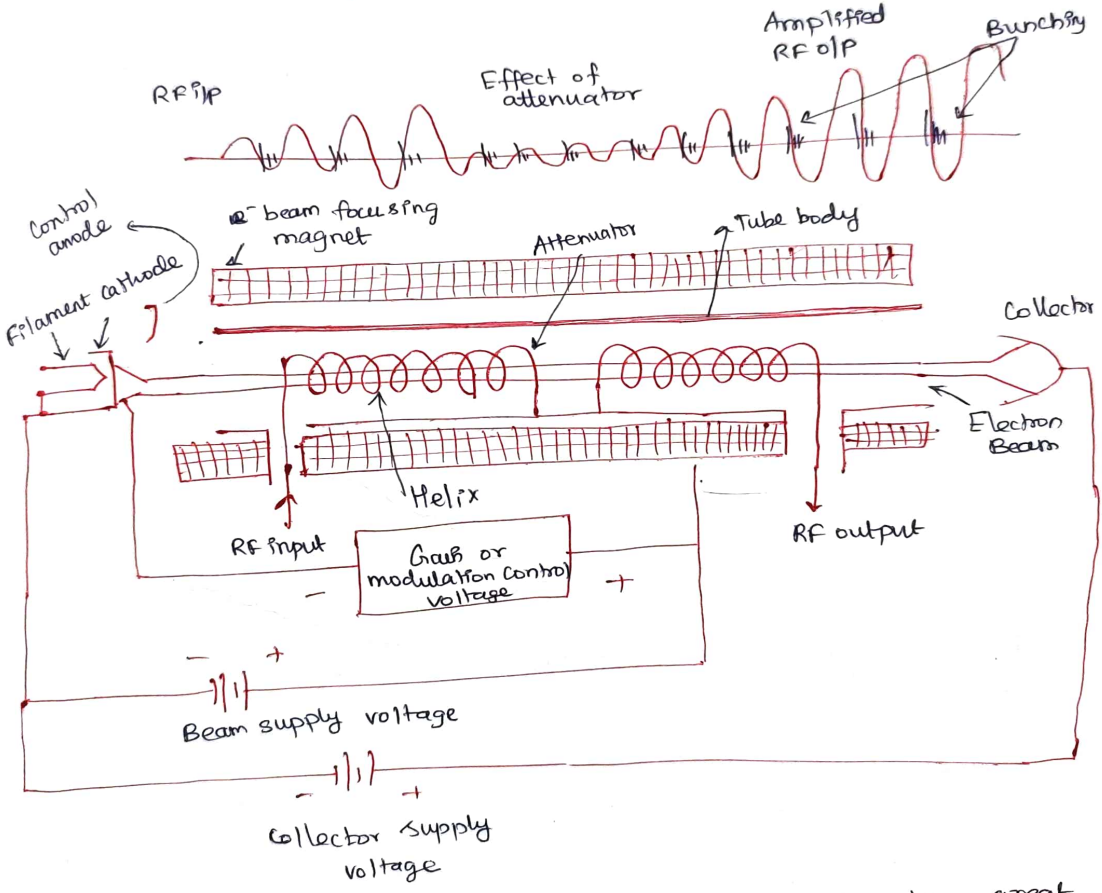
* Non resonant microwave circuit

[whereas, In klystrons & magnetrons → resonant → limits the BW]

* velocity modulation caused by weak electric fields associated with the traveling wave.

* Velocity modulation later translates to current modulation - induces RF current in the ckt, causing an amplification.

TWT Amplifier Tube and circuit



* During transit along the axis, the electron beam transfers great amount of energy to the traveling signal wave and thus signal field amplitude increases.

Need for slow-wave structures (Helix Tube)

Slow wave structures are special circuits that are used in microwave tubes to reduce the wave velocity in a certain direction so that electron beam and signal wave can interact.

Characteristics of TWTA

Freq. range : 3GHz and higher

BW : about 0.8 GHz

Efficiency : 20 to 40 %.

Power o/p : upto 10 KW average

Power Gain : upto 60 dB

Applications :

used in

* Medium power satellite
* High power satellite transponder output
* Radar transmitter
* Broadband μwave Amplifier.

Outcome :

able to explain slow wave structures & the operation of TWT Amplifier.

—x— x—