

(ii) **High Power Amplifier (HPA)**

HPAs are the high power amplifiers used in the transmitters of earth station.

The signals to be transmitted are in the microwave frequency range, hence microwave tubes and solid-state power amplifiers can be used. Microwave tubes are required for high power amplification whereas solid state amplifiers for low power amplification. There are four types of amplifiers that are commonly used.

1. Klystron tube
2. Travelling Wave Tube (TWT)
3. FET Amplifier
4. BJT Amplifier.

The comparison of these amplifiers is given below.

Amplifier Type	Output Power in Watts	Bandwidth in MHz
Klystron	500-5000	40
Travelling Wave Tube (TWT)	100-2500	500
FET (6 GHz)	5-50	large
BJT	0-50	wide

**Advantage**

High power amplifiers do not require very high voltages as that needed by TWT and Klystron amplifiers.

**Disadvantage**

High power amplifiers are not economical, when more than a few voice channels are to be combined.

**Applications**

1. High Power Amplifiers (HPAs) are used in large earth stations.
2. They are used in z and electronic warfare applications.
3. HPAs are also used in maritime satellite communication systems for shipboard transmitters operating at 1.6 GHz.