

Voice Transmission

Chapter 1

The word “telephone” derives from the two Greek words *tele* which means “distance” and *phone* which means “sound or voice”. These two words combine together to reveal that the telephone is a means of carrying sound or voice over a distance. Hence the main function of a telephone is to reproduce the transmitted signal at the receiving end.

Voice is carried through a transmission media. There are three.

- I. Copper wires
- II. Radio
- III. Optical fibers

To suit these transmission media, first it is necessary to transform voice into an electrical signal. To do this the characteristics of voice or sound should be analysed.

When we speak we produce a series of sound waves in different frequencies. If these waves are sent through a microphone it gives a general voice signal like in figure 1.1.

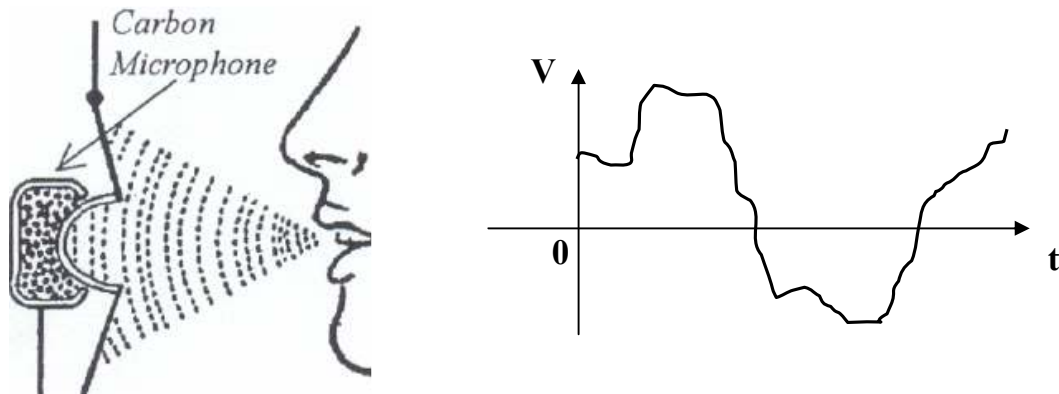


Figure 1.1

Likewise voice is transformed into an electrical signal. This single voice signal is a combination of many Sine waves of different frequencies as can be seen in figure 1.2.

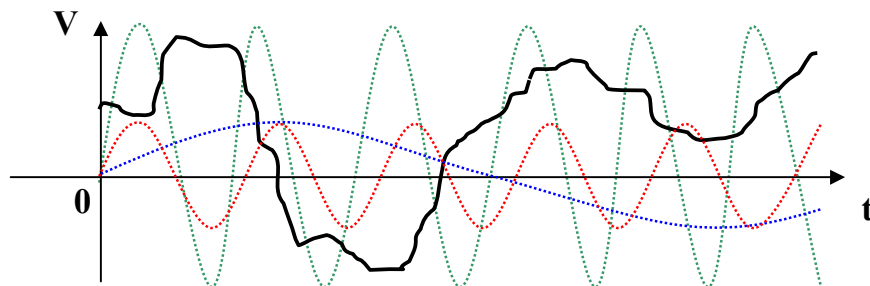


Figure 1.2

This same procedure is followed in a telephone. Voice is transformed into an electrical signal by a carbon microphone. Hence when we speak through the transmitter of the telephone a voltage-time wave as in figure 1.1 is produced. The sign of the wave (+/-) depends upon the direction of the moving carbon particles.

After transforming voice into an electrical signal it is transmitted to the telephone exchange through Copper wires. These signals are band limited signals of 0-4 kHz.

Why do we say that they are band limited in the range of 0-4kHz?

Human ear responds to sound waves in the frequency range of 20Hz – 20kHz. A problem arose regarding what range to take for signal transmission from the above range. In other words it was necessary to band limit these signals. Therefore the purpose of transmission was analysed in order to find a solution.

When we listen to a music CD or the television or even the radio we expect to detect the quality of the music or voice. There are three main characteristics in a voice or sound.

- I. Pitch
- II. Volume or Intensity
- III. Timbre

For transmission the first and third characteristics are very important. The pitch depends on frequency. Take the example of a musical scale. Each note has a different frequency.

Middle C	D	E	F	G	A	B	C
256 Hz	288 Hz	320 Hz	340 Hz	384 Hz	426 Hz	480 Hz	512 Hz

Suppose you are listening to some orchestral music from a CD, you must be able to recognise the melodies from different instruments as well. Even if a same frequency is produced by a saxophone and a guitar, the sound qualities are different, which is called the tone or Timbre. Timbre depends on the quality of the sound producing agent.

Hence in order to transmit all these qualities a wide range of frequencies should be allowed. Therefore radio and television links have a higher frequency range.

What is the purpose of telecommunication?

The main purpose of telecommunication is to send a message between two people from different locations. As long as the message is received the function of a telephone is achieved. It is not necessary to detect how beautiful the voice is, which indicates that it is unnecessary to use a wide range of frequencies.

The CCITT* experimented on the range which is most suitable for voice transmission and found out that 0-4kHz would be sufficient enough to transmit any message clearly. Hence all telephone networks around the world use a band-limit of 0-4kHz.

**The CCITT – Comté Consultatif International de Télégraphique et Téléphonique (International Consultative Committee on Telecommunications and Telegraphy) is the primary international body for fostering cooperative standards for telecommunication equipment and systems. It is located in Geneva, Switzerland. CCITT is now known as ITU (International Telecommunications Union).*