

The Essence of Ham Radio - V Different Modes of Ham Radio Communication

In the last issue we have discussed about the Morse Code and Packet Radio communication techniques used by ham radio operators. It is interesting to note that all the various forms of communication techniques involving radio waves employed by the ham radio operators can be explored even in our ordinary radio receiver sets. Our ordinary radio sets have largely remained unexplored due to the lack of information about the different radio frequencies used by the ham radio operators and also due to the lack of information about different modes used by them. **Morse Code** is the simplest form of radio communication technique in which the radio waves produced by a radio transmitter can be made to carry information without incorporating any audio. A continuously transmitted radio wave (called **continuous wave or CW**) can be interrupted intentionally by switching 'ON' and 'OFF' the radio transmitter. The resulting radio wave, which is transmitted, consists of 'dot' and 'dashes'. In an ordinary radio receiver these can be heard as a 'hissing' sound and sometimes heard like electrical sparks produced in our radio when electrical switches are switched "ON" or 'OFF'. We shall describe a technique to convert these hissing sounds into audio tones in the later part of this article. A 'dot' is heard like a short audio tone and a 'dash' as a long audio tone. Different combinations of these short and long audio tones represent different alphabets, characters and punctuations of the English language. In case of 'voice' communication, the radio waves produced by the radio transmitter can be modulated with our audio. The audio can be superimposed into the radio wave by various techniques.

Amplitude Modulation (AM) and Single Side Band (SSB)

Contrary to the broadcast radio stations (with thousands of watts of power), a ham radio operator usually transmits with power of below 100 watts (as per the government prescribed legal power limit for ham radio operators) and sometimes even with much lesser power than 5 watts. Our ordinary short wave radio receiver sets are not sensitive enough to pick up the weak radio signals of ham radio operators. Again, the ordinary radio sets are designed for reproducing the audio (voice or music) sent through AM (Amplitude Modulated) or FM (Frequency Modulated) radio signals only. But ham radio operators mostly use SSB (Single Side Band, which is technically designated as J3E) for voice as well as analogue & digital data communication. An SSB transmitter has many advantages over an AM transmitter and is best suited for long distance two-way wireless voice communication where music-quality sound is not a must. An AM radio signal occupies double the space in the radio frequency spectrum compared to a Single Side Band (SSB) radio signal. Thus the use of SSB helps saving the precious radio space in a particular band. The radio frequency carrier wave on which the voice or audio is superimposed can be suppressed resulting in a Single Side Band suppressed carrier signal. For equal information content, a carrier suppressed SSB radio signal would require only $\frac{1}{6}$ th power of a double sideband AM signal. Thus the wireless transceivers (a combined unit of

transmitter and receiver) used by ham radio operators can be made smaller in size making them portable and useful for two way emergency communication. This technique is not only used by ham radio operators, but also by all other professional radio communication services. **An ordinary short wave radio receiver can also be utilized for intelligible reproduction of the SSB voice transmissions of ham radio operators.** We shall discuss this technique in the next issue.

Is there anything called ham radio equipment

There is no such thing as 'ham radio equipment'. A wireless equipment, which can transmit and receive in the radio frequencies allotted to the ham radio operators, can be used to contact another ham radio operator. A wireless equipment, when made or used by a ham radio operator is referred as a ham radio equipment; When a wireless equipment is used by the police, it is called a police wireless equipment! The same equipment may be used by different agencies for different purposes. But they have to operate the equipment as per the frequencies allotted by the government. Different agencies have been allotted different frequencies. The principle of operation of all the wireless equipment is the same. But members of one agency are authorized to talk to the members of their own agency only. A policeman is not authorized to talk to a ham radio operator and visa-versa. The commercially made wireless transceivers have a general frequency coverage for listening purpose. But when sold to different agencies, their transmission frequencies are set as per the allocation made by government so that the user cannot transmit in an unauthorized band. For example, one of the authorized bands allotted to ham radio operators is the 40m short wave band ranging from 7000 kHz to 7100 kHz (see the dial of your receiver to locate this band!). A broadcast station or stations from other agencies are not allowed to transmit within this range.



For establishing a radio contact, both the wireless device should be tuned to the same radio frequency so that they can listen to each other. It is as simple as listening to a particular radio station using your ordinary radio. You can listen to a particular radio station (say, an All India Radio Broadcast Station) when you know its frequency and tune your radio set to that frequency. You should also know its broadcast schedule (time). If the station is not *on-the-air*, you can not listen to it. And you cannot also listen to that station at another frequency!

(to be continued in the next issue)

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