

STANDARD FREQUENCY BROADCAST SERVICE

Frequency standards that are broadcast daily by the National Bureau of Standards for use in accurately calibrating all types of radio equipment.

TABLE I. TRANSMITTED RADIO FREQUENCIES.

2.5 megacycles (= 2500 kilocycles = 2,500,000 cycles) per second, broadcast from 7:00 P.M. to 9:00 A.M., EWT (2300 to 1300 GMT).
5 megacycles (= 5000 kilocycles = 5,000,000 cycles) per second, broadcast continuously day and night.
10 megacycles (= 10,000 kilocycles = 10,000,000 cycles) per second, broadcast continuously day and night.
15 megacycles (= 15,000 kilocycles = 15,000,000 cycles) per second, broadcast from 7:00 A.M. to 7:00 P.M., EWT (1100 to 2300 GMT).

TWO changes beginning Feb. 1, 1944, are announced in the standard frequency broadcast service of the National Bureau of Standards. One is the addition of a new radio frequency, 2500 kilocycles per second, at night. The other is omission of the pulse on the 59th second of every minute. The entire service is described here. It comprises the broadcasting of standard frequencies and standard time intervals from the Bureau's radio station WWV near Washington, D.C. The service is continuous at all times day and night, from 10-kilowatt radio transmitters. The services include: (1) standard radio frequencies; (2) standard time intervals accurately synchronized with basic time signals; (3) standard audio frequencies; (4) standard musical pitch, 440 cycles per

second, corresponding to A above middle C.

The standard frequency broadcast service makes widely available the national standard of frequency, which is of value in scientific and other measurements requiring an accurate frequency. Any desired frequency may be measured in terms of any one of the standard frequencies, either audio or radio. This may be done by the aid of harmonics and beats, with one or more auxiliary oscillators.

At least three radio carrier frequencies are on the air at all times, to insure reliable coverage of the United States and other parts of the world. The radio frequencies that are transmitted are shown in Table I.

Two standard audio frequencies, 440 cycles per second and 4000 cycles per

second, are broadcast on the radio carrier frequencies of 5, 10, and 15 megacycles. The audio frequency 440 cycles only is broadcast on 2.5 megacycles. The 440 cycles per second is the standard musical pitch, A above middle C; the 4000 cycles per second is a useful standard audio frequency for laboratory measurements.

In addition there is on all carrier frequencies a pulse of 0.005-second duration which occurs periodically at intervals of precisely one second. The pulse consists of five cycles, each of 0.001-second duration, and is heard as a faint tick when listening to the broadcast; it provides a useful standard of time interval, for purposes of physical measurements, and may be used as an accurate time signal. On the 59th second of every minute the pulse is omitted.

The two audio frequencies are interrupted precisely on the hour and each five minutes thereafter; after an interval of precisely one minute they are resumed. This one-minute interval is provided in order to give the station announcement and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. The announcement is the station call letters (WWV) in telegraphic code (dots and dashes), except at the hour and half hour when a detailed announcement is given by voice.

The accuracy of all the frequencies, radio and audio, as transmitted, is better than a part in 10,000,000. Transmission effects in the medium (Doppler effect, etc.) may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received is however as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.000 01 second. The 1-minute, 4-minute, and 5-minute intervals, synchronized with the seconds pulses and marked by the beginning or ending of the periods when the audio frequencies are off, are accurate to a part in 10,000,000.

The beginnings of the periods when the audio frequencies are off are so synchronized with the basic time service of the U. S. Naval Observatory that they mark accurately the hour and the successive 5-minute periods.

Of the radio frequencies on the air at a given time, the lowest provides service to short distances, and the highest to great distances. Reliable reception is in general possible at all times throughout the United States and the North Atlantic Ocean, and fair reception throughout the world.

Information on how to receive and utilize the service is given in the Bureau's Letter Circular, "Methods of using standard frequencies broadcast by radio," obtainable on request. The Bureau welcomes reports of difficulties, methods of use, or special applications of the service. Correspondence should be addressed National Bureau of Standards, Washington, D. C.

Transmitting station, typical of many that are calibrated by means of frequency standards.

