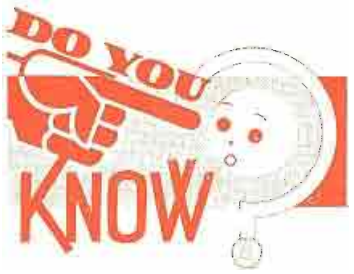

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THAT the power output from one microphone is so small that it would require the combined output of twenty-four billion microphones—or about twelve to every human being on earth—to produce sufficient power to light an ordinary 40-watt electric light bulb. Broadcast microphones produce only .00000000166 watts. This is amplified thirty trillion times (30,000,000,000,000) before being broadcast from a 50,000-watt station. This is accomplished without distorting the character of the original complex sound wave.

SOUND WAVES

That radio waves travel with the same velocity as light—186,000 miles per second. This is equal to a distance seven and one-half times around the world? Audio signals transmitted over telephone circuits, such as are used for network transmission, have a velocity of approximately 20,000 miles per second. Contrast this with the speed of sound waves, which is approximately 1100 *feet* per second. Because of the difference between the speeds of radio and sound waves, a broadcast listener in California, or a short-wave listener on the opposite side of the world, can hear a program broadcast from the stage of a New York CBS Playhouse before a spectator seated in the last row of the orchestra hears it.

OPERATING FREQUENCY

That radio engineering is one of the most exact of sciences? The operating frequency of most American broadcast stations is maintained with 10 cycles of its assigned frequency. At 1000 kilocycles, this represents a deviation of only ten parts in one million.

RECEPTION

That geography has a lot to do with radio reception in your home? The primary service area of a broadcast station is dependent upon the station location, frequency, power, soil conductivity, topography, antenna radiating efficiency, interference from other stations and interference created by electrical noises—both man made and natural.

1937 BROADCAST HOURS

That more than 3,250,000 hours of broadcasting took place in the United States this past year? Nine stations operated by CBS originated 100,000 programs during this period. Of these 100,000 programs 20,000 originated for the Columbia network from the New York studios alone. This vast amount of entertainment was made available to 25,000,000 radio homes and 4,000,000 radio equipped automobiles. There are at the present more than 100,000,000 radio listeners in this country.

FADING

That fading is caused by the "sky" and "ground" wave signals, radiated from a single location, arriving at the point of reception over paths of different distance? This results in the signal being received at different intervals of time. Broadcast receivers that use automatic volume controls compensate to a great degree for "carrier" frequency fading but are not capable of eliminating "selective" fading, which is the result of the "carrier wave" and side band or audio frequencies fading at different time intervals. This phenomena identifies itself by "mushy, distorted" reproduction. Fading is a transmission evil which engineers are continually investigating in the hope of eventual reduction or pos-

sible elimination. During the past few years the use at many stations of so-called "anti-fading" antennas has greatly improved this condition.

WIRE LINES

That more than 60,000 miles of wire lines are used, on a permanent basis, to distribute broadcast programs throughout the country? The Columbia Broadcasting System, the world's largest broadcasting network, is comprised of 111 stations located in the principal cities of the United States, Canada and Hawaii. The amount of electrical power consumed by these CBS stations in one year would operate the average receiving set three hours per day for 250,000 years.

PERFORMANCE STANDARD

That all broadcast stations must, according to regulations, operate with good engineering practice? A modern station should be capable of stable high-fidelity performance from microphone input to antenna output inclusive. Satisfactory performance standards, as present, are as follows:

(A) Studio acoustical properties should be properly related to equipment performance characteristics. The average reverberation period should be optimum for a given studio size and should be substantially the same at all frequencies from 50 to 8000 cycles per second.

(B) The audio response from microphone input to antenna output should be uniform from 50 to 8000 cycles per second.

(C) Overall audio distortion should not exceed 3% r-m-s from 50 to 8000 cycles per second at 95% modulation with full rated antenna input power.

(D) Extraneous noise and hum modulation should be 60 decibels, unweighted, below 100% modulation.

(E) Radio frequency harmonic signal intensity at one mile should be 70 db or more below fundamental signal intensity.

(F) The carrier frequency should be maintained within ±10 cycles per second of the assigned frequency.

(G) Antennas should produce an effective field intensity at one mile, with one kilowatt antenna input power, corrected for attenuation of at least 160 mv/m for low-powered stations and 230 mv/m for high-powered stations.

INTERNATIONAL BROADCASTS

That international broadcast station activities in this country reached a new high this year? More than 200 international program relays, originating at many worldwide points, were sent to CBS audiences in the United States. CBS international station W2XE, operating on its five assigned frequencies, was on the air more than 5,000 hours during the past year and transmitted 12,000 programs, many of which were arranged for W2XE's international audience only. Thousands of letters addressed to station W2XE were received from 38 foreign countries and from nearly every state in the Union. The operating schedule, as related to frequencies used by this station, is changed several times annually in order to render maximum service at distant points. The best frequency for optimum results is, in general, dependent upon time of day and season of the year. This station uses high-gain directional antennas which radiate a maximum amount of energy either in the direction of Europe or toward Central and South America.

EQUIPMENT DEVELOPMENTS

That although the improvement in the fidelity of transmission and reception is a gradual transition process, there were many recent outstanding circuit and equipment developments resulting in more efficient technical operation? These developments include the Doherty circuit used in high powered broadcast transmitters; stabilized or negative feedback used in both audio amplifiers and in broadcast transmitters; the uni-directional microphone; the automatic peak volume limiter; the shunt-fed antenna; high, uniform cross-section, anti-fading vertical radiators; new and greatly simplified measuring equipment used for routine checking of station equipment performance; greatly improved receiving sets; all-wave antenna kits; automatic tuning.

RADIO SPECTRUM

That less than one-half of the broadcast stations in the country are affiliated with national networks? Of the total usable radio wave spectrum, the broadcast band 550 to 1600 kilocycles inclusive occupies only three-tenths of one per cent (0.3%) of the radio spectrum, which includes radio frequencies from 10 to 300,000 kilocycles per second. A broadcast channel is 10 kilocycles wide. Contrast this with the present-day television channel which is 6,000 kilocycles in width. A single television channel would, on the present basis used in allocating broadcast stations, accommodate 4000 broadcast stations.