

THIS supplemental brief, like the brief dated October 7, 1947, and filed by me in this proceeding, is directed to the question specified in the Commission's Order of September 19, 1947, viz., as to which category of radio service should be assigned the band of frequencies from 44 to 50 mc.

The specific purpose of this brief is to reply to certain testimony presented at the hearing by Edward W. Allen, Jr., Chief of the Technical Information Section of the Commission, and Kenneth A. Norton, formerly employed in the same Section of the Commission.

This brief is concerned with an observed and now well-demonstrated physical fact, namely, that at distances beyond the horizon a phenomenon known as fading appears, which affects the frequencies around 100 mc. much more seriously than it affects the frequencies around 50 mc.

As a result of that physical fact, various stations on the Continental Network at distances above 75 miles from Alpine, are unable to receive the 92.1 mc. transmissions from Alpine with sufficient reliability to rebroadcast them; but do receive the Alpine signals on the 44.1-mc. channel with sufficient reliability and do rebroadcast them. Station WBCA at Schenectady is an example. It is located some 100 miles from Alpine and has been rebroadcasting the low band programs from Alpine for upwards of 5 years.

The same physical fact was observed by me as early as 1938, when I had experimental transmitters operating on the 117-mc. band and on the 42-mc. band, and my observations were reported to the Commission at the allocation hearings in 1944 and 1945.

For the purpose of getting an accurate comparison of the effects of fadings on the two bands, I have been conducting tests at Westhampton Beach since July, 1947, making recordings of the two Alpine signals, one on 92.1 mc. and the other on 44.1 mc. Each of the stations has approximately 100 kw. power, which is enough to permit highly accurate measurements to be made. The two antennas are located on the same tower and are of the same height, so that the signals travel over the same path. Westhampton Beach is 70 miles from the Alpine station, and the conditions of reception there are ideal for checking the accuracy of theoretical predictions, since there is a clear path across Moriches Bay, no hills of any consequence between the transmitter and receiver, and little or no local interference. Specially designed crystal-controlled receivers are used, and the recorder armatures are driven directly by current obtained from crystal rectifiers. I do not believe that the accuracy and reliability of the apparatus used in the Westhampton Beach tests will be questioned by anyone. All the recordings taken during the period from September 7 to November 8, 1947, were presented to the Commission at the hearing. They show that for approximately 50% of the days in that period the signals on 92.1 mc. suffered severely from fading, whereas the 44.1-mc. signals were not substantially affected by fading.

**Mr. Allen's Curves** \* Against this background of observation and tests, Mr. Allen has prepared 6 charts designed to show that the physical fact so observed and demonstrated does not actually exist. At the hearing, Mr. Allen presented a report dated November 18, 1947, entitled "Preliminary Report on East Coast Tropospheric and Sporadic E Field Intensity Measurements on 47.1 and 106.5 Mc." (Exhibit 592). The charts, which are contained in the report are designed to show the relative performance of low and high band signals 47.1 mc. and 106.5 mc.) at distances of 45, 68 and 185 miles from the transmitters - the important distance, for present purposes, being the intermediate distance of 68 miles.

These charts present graphically Mr. Allen's conclusions, which are directly opposite to the conclusions arrived at in the Westhampton Beach tests and corroborated by other observations made at many points. Specifically, they purport to show that at Southampton, Pa, where signals on 47.1 mc. and 106 mc. were received from 2 stations located in New York on top of the same building, at a distance 68 miles, the transmission on 106 mc. was very much better than on 47.1 mc.; that, in fact, the field strength which was exceeded for 99% of the time on the high band was 3.5 times the field strength so exceeded on the low band.

The shortest and perhaps the most satisfactory answer to a series of curves purporting to demonstrate that an observed physical fact does not exist is the answer that would be given to a similar demonstration that the earth was flat.

By whatever means the conclusions may have been arrived at, and whatever errors may have been involved, the inescapable fact is that the conclusion is wrong.

Mr. Allen did not present to the Commission the underlying recordings on which his analysis was based, but those I have now examined pursuant to permission given to me at the hearing (Tr. 774), and it is my conclusion that there were fundamental errors in both the tests made and the methods of analysis that Mr. Allen applied to them.

**Failure to Measure Transmitter Power** \* Mr. Allen was comparing stations with widely different amounts of power - the 47.1-mc. transmitter having an assumed power of 10 kw. and the 106.5-mc. transmitter an assumed power of 725 watts.\* It was necessary for him, therefore, to convert, his results into a common denominator, i.e., field strength per kilowatt. His comparison would necessarily be affected by any variation of the radiated transmitter power from the assumed power. Hence the first requirement in any such test is to get an accurate check on the radiated power of each transmitter by making field strength measurements at a suitable location within line of sight. That Mr. Allen failed to do; and for this reason alone his results are unreliable.

The first explanation that would occur to anyone who inquired why the Commission's tests showed results so widely different from the practical experience of broadcasters and listeners is that the effective transmitter power on the low band was nothing like the 10 kw. that Mr. Allen assumed it was; and that conclusion is strongly supported by Fig. 5 of the Allen Report (Exhibit 52), which compares actual and theoretical field intensities at the various points of reception. There it is shown that at Princeton, 45 miles from the transmitter, the highband signal was approximately equal to the theoretical field strength (as per the Norton Curves), while for the low band signal there was a wide discrepancy an actual figure of only 22 for the median field as compared with a theoretical figure of 56.

In other words, the actual field intensities of the low band station, measured at Princeton, fell 60% short of those called for by the Norton Curves.

\*From October 10, to the end of the Southampton tests on November 20, the transmitter was equipped with a radar antenna and for that period it may be assumed that the effective power was above 50 kw.