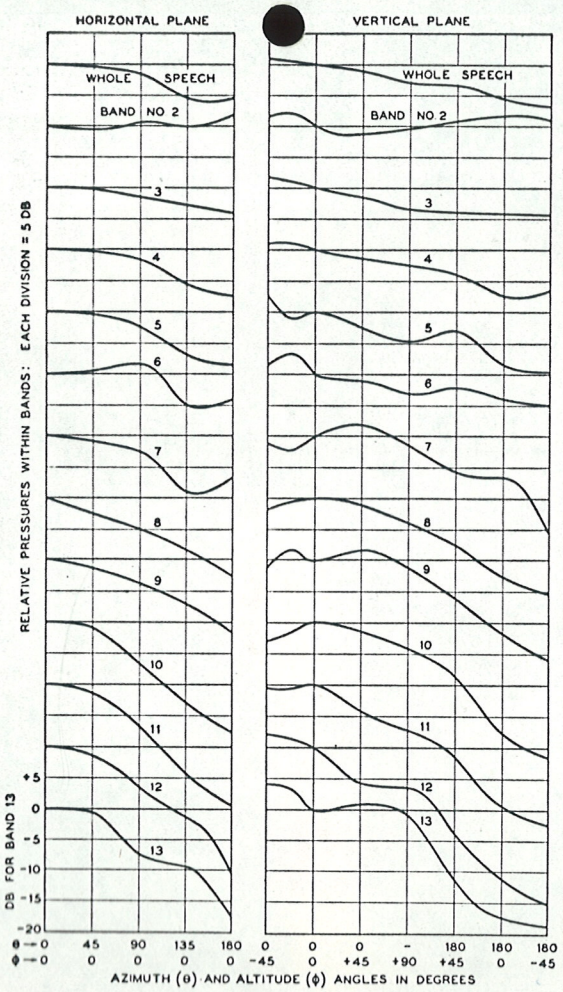

FIG. 11. Same data as in Figs. 9 and 10, but the pressures in each band are plotted as continuous functions of the angular coordinates in the horizontal and vertical planes: $r = 60$ cm.

bands 5 and 6, a possible explanation of the more even distribution of band 6 pressures (as shown in Fig. 11) was suggested. However, an attempt to measure the actual magnitude of the body radiation did not support this hypothesis. This test was made by having the speaker talk into a large sound-absorbing box, a soft rubber seal preventing radiation from mouth and nose into the air outside the box. The remaining radiation was then measured at two points. One of these was the [15, —, −90] position discussed above. Although close regulation of speaking level and spectrum were not possible, the results indicated that body radiation has an inappreciable effect in all bands above 500 cycles, in comparison with mouth radiation. In the lower bands, it was indicated that the pressures originally measured in this position might be reduced by the following amounts, if body radiation could be excluded: band 2, 3 to 5 db; 3, about 2 db; 4, about 1 db. The other position investigated was [30, 180, 0], or directly to the rear. There it was indicated that the reduction due to removal of body radiation would be about 1 db each in bands 2 and 3, about 0.5 db in band 4, and inappreciable amounts in the rest of the spectrum. We conclude that the even distribution in band 6, and the higher pressures in the downward direction in the bands below 1000 cycles (with the possible exception of bands 2 and 3) are due to peculiarities of the sound shadow which are, as yet, unpredictable. Reflections from the chest may play a part. It should be added that higher pressures below the −45° line, in the lower bands, are also shown by the measurements at [30, 0, −67.5] and at [10, —, −90]. Measurements below −45° were not possible at the 60-cm distance, with the speaker in the sitting position.

APPLICATION TO LISTENING CONDITIONS

The spatial distributions obtained were an average over fifteen seconds of speech. The question may then be raised whether different sounds, having energy in the same frequency region but produced by different mouth configurations, might not have different distributions. While this question cannot be answered definitely with present information, it seems almost certain that such effects would be small, and probably inappreciable unless for consonant sounds involving frequencies above 6000 cycles. If this is correct it should be possible to locate a microphone in any direction from a speaker, equalize according to the measurements given here, and obtain reproduction not distinguishable from speech heard in front of the speaker. The average listener is not likely to notice changes of a few db in parts of the spectrum with respect to the rest, and on this basis the measurements would indicate no equalization to be necessary in most of the space forward of the speaker, from −45° to +90° in altitude, and out to about 75° in azimuth, on either side.

To confirm these conclusions, in part, we have