Subjective Interpretation of Loudspeaker Frequency Response Curves in terms of Loudness.

IN objective measurements of the overall response of sound reproducing systems, the need is continually felt of a method of interpreting them subjectively. We have found it possible, by utilising Kingsbury's scale of loudness and his measurements at different frequencies connecting the sensation level of a pure tone with its loudness,[1] to derive loudness-frequency characteristics. By way of example, in Fig. 1, is shown a typical measured acoustical response curve for a high quality loudspeaker. This type of curve can refer to the loudspeaker when supplied with constant current or when associated with its amplifier, or to the overall response characteristic corrected for different factors such as the change in the polar distribution of radiation with frequency.

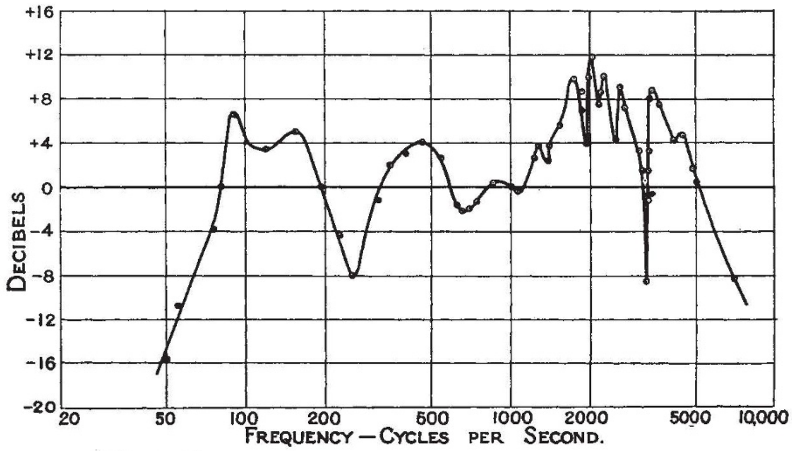

FIG. 1.—Typical acoustical response characteristic for a loudspeaker.

In Fig. 2 are shown the deduced loudness-frequency characteristics, corresponding to the objective curve in Fig. 1, for specified sound pressure levels at 1000 cycles per second (the frequency of zero level in Fig. 1), and these characteristics refer to the loudnesses of single pure tones when listened to in silent surroundings. The smooth chain curves passing through them refer to an ideal system in which the response is perfectly uniform at all frequencies. Departures of the actual loudness curves from these smooth curves give a measure of the frequency distortion of the apparatus in terms of loudness, and an observed variation in response in Fig. 1 is seen to cause a greater percentage change in loudness as the volume level of reproduction is decreased. Such curves as those shown in Fig. 2 are valuable as showing quantitatively how the apparent frequency range and tonal balance depend upon the absolute value of the sound pressure at the ear. The effect is analogous to the well-known change in tonal quality as one walks away from a band playing in the open air. The sound pressure at the ear is determined by either the distance from the source of sound or the overall characteristics of the electro-acoustical system. Solid models can be constructed from which the loudness may be read immediately at any frequency and sound pressure.

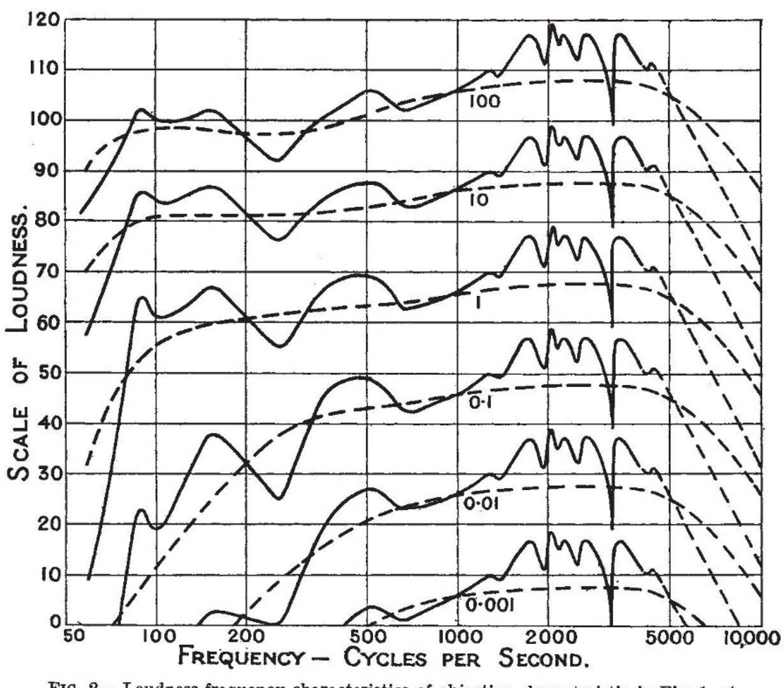

FIG. 2.—Loudness-frequency characteristics of objective characteristic in Fig. 1, at different sound pressure levels in dyne/cm.[2]

It is hoped to discuss some cases of technical interest at a later date.

D. A. OLIVER.
Research Laboratories of the General Electric Company, Ltd., Wembley, July 15.

[1] Kingsbury, *Phys. Review*, **29**, 588; 1927. Also "Speech and Hearing", by H. Fletcher, p. 230. Fig. 108.

Classification for Bibliography of Science.

MR. BLISS [1] has proposed the thesis, with which he is so good as to couple my name, that classification should be applied methodically to scientific literature and that the study of classification should now become a first concern of national and international organisations.

I am very glad to see that Mr. Bliss recognises the necessity for tackling the overwhelming output of scientific and technological writings. But I am not quite satisfied with his presentment of my case. I hope I am not doing him an injustice, but Mr. Bliss appears to be more interested in the perfection of the classification used than in the indexing of the literature, or, he seems to think that a perfectly logical classification is necessary for the preparation of a subject catalogue. But those who are working for the production of a comprehensive index to published scientific and technical information are inclined to look upon the classification adopted as merely a means to an end, and to criticise its comprehensiveness and flexibility rather than its philosophical basis.