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Decibel—The Name for the Transmission Unit

By W. H. MARTIN

IN 1923 the "mile of standard cable" was replaced in the Bell System by a new unit for expressing telephone transmission efficiencies and levels. At that time the generic term "transmission unit" was taken to designate this new unit, since it was considered desirable to defer the adoption of a more distinctive name until this unit had been given further consideration by others who would have use for a unit of this type. This new unit is defined by the statement that two amounts of power differ by one transmission unit when they are in the ratio of 10^{-1} , and any two amounts of power differ by N transmission units when they are in the ratio of $10^{N(-1)}$. In accordance with this, the number of transmission units corresponding to the ratio of any two powers is ten times the common logarithm of that ratio.

For a unit of this kind, it is evidently desirable to have universal use. Accordingly, the Bell System, prior to its adoption of the transmission unit, discussed this matter with various foreign telephone administrations, and suggested their consideration of the use of the proposed "transmission unit." A number of these administrations expressed a favorable attitude towards this unit.

In 1924 there was organized the International Advisory Committee on Long Distance Telephony in Europe. The purpose of this committee, which is composed of representatives of the various telephone administrations of Europe, is to recommend standards and practices for the development of telephone service between the European countries. One of the early considerations of this committee was this proposal of the universal standardization of a unit for telephone transmission work. This brought forth a difference of view, since some of the countries represented on this committee wished to continue their use of a unit based on naperian or natural logarithms, for which the basic power ratio is e^2 . The characteristics of the unit based on decimal logarithms and that based on natural logarithms and their relative merits were discussed in a number of papers which were published at that time * and so need not be rehearsed here.

At the request of the International Advisory Committee, representatives of the Bell System attended some of their meetings at which

this matter was discussed. In this joint consideration there arose the suggestion that the fundamental unit on the decimal basis be defined to be equal in magnitude to that of ten transmission units, so that the basic power ratio would be 10^1 . The units proposed thus came to one based on the power ratio of 10^1 and the other on the power ratio of e^2 , with the provision that decimal submultiples of either unit could be employed, using the customary prefixes to give the proper indication. On this basis, the numbers of the two kinds of units corresponding to a given power ratio, differ by about 15 per cent. It was further suggested that the naperian unit be called the "neper" and that the fundamental decimal unit be called the "bel," these names being derived respectively from the names of Napier, the inventor of natural logarithms, and Alexander Graham Bell.

These joint considerations have had the following results. The European International Advisory Committee has recommended to the various European telephone administrations that they adopt either the decimal or naperian unit and designate them the "bel" and "neper" respectively. The Bell System has adopted the name "decibel" for the "transmission unit," based on a power ratio of 10^{-1} . This is in accordance with the terminology for the decimal unit, the prefix "deci" being the usual one for indicating a one-tenth relation. **For convenience, the symbol "db" will be employed to indicate the name "decibel."**

* *References:*

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