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TELECOMMUNICATION
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TELEPHONE TRANSMISSION QUALITY

OBJECTIVE ELECTRO-ACOUSTICAL MEASUREMENTS

METHODS FOR THE CALIBRATION OF CONDENSER MICROPHONES

ITU-T Recommendation P.61

(Extract from the *Blue Book*)

NOTES

1 ITU-T Recommendation P.61 was published in Volume V of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).

2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Recommendation P.61

METHODS FOR THE CALIBRATION OF CONDENSER MICROPHONES

(amended at Malaga-Torremolinos, 1984)

Primary and secondary calibrations of condenser microphones can be carried out using the methods described below.

1 Primary calibration by the reciprocity method

The recommended procedure for primary calibration of condenser microphones is the reciprocity calibration technique. A precision method for reciprocity pressure calibration is described in [1]. A simplified method, suitable for calibration over the frequency range of interest for telephonometric measurements, is given in [2]. Although the methods described are specifically for one-inch microphones, similar methods are applicable to half-inch microphones. Methods suitable for half-inch microphones are under study by IEC.

A precision method for free-field reciprocity calibration is given in [3]. Alternatively, the free-field correction curves given in [4] may be applied to the pressure calibration of one-inch condenser microphones to determine their free-field responses. The reciprocity free-field calibration method may in principle be extended to half-inch microphones. Free-field correction curves have not been standardized for half-inch microphones.

2 Secondary calibration by the comparison method

The secondary calibration of a condenser microphone may be achieved by direct comparison with a physically identical microphone having a known calibration. The procedure used is a modification of the “two microphones and auxiliary sound source” method described in [1] to [3]. The output of the calibrated microphone is first determined for a given drive level applied to the auxiliary sound source. The calibrated microphone is then replaced by the microphone to be calibrated, and its output is determined for the same drive level applied to the auxiliary sound source. The difference in level (in dB) between the outputs of the two microphones is then applied to the known calibration of the first microphone to determine the calibration of the second. The procedure is repeated at each frequency of interest.

3 Secondary calibration using pistonphones and other sound level calibrators

Secondary calibrations can also be made using pistonphones and other sound level calibrators which produce a known sound level. Such devices are often used to check the calibration of a microphone at a single frequency¹⁾. Care should be taken to follow the manufacturer's instructions when using such devices; in particular, it may be necessary to apply corrections for barometric pressure, coupler volume, microphone type, etc. Standardization of these calibrators is currently under study by the IEC.

References

- [1] International Electrotechnical Commission *Precision method for pressure calibration of one-inch standard condenser microphones by the reciprocity technique*, IEC publication 327, Geneva, 1971.
- [2] International Electrotechnical Commission *Simplified method for pressure calibration of one-inch condenser microphones by the reciprocity technique*, IEC publication 402, Geneva, 1972.
- [3] International Electrotechnical Commission *Precision method for free-field calibration of one-inch standard condenser microphones by the reciprocity technique*, IEC publication 486, Geneva, 1974.
- [4] International Electrotechnical Commission *Values for the difference between free-field and pressure sensitivity levels for one-inch standard condenser microphones*, IEC Publication 655, Geneva, 1979.

¹⁾ Calibrations with an accuracy of ± 0.3 dB are possible.