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# INTERNATIONAL STANDARD



# 454

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION · МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ · ORGANISATION INTERNATIONALE DE NORMALISATION

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## Acoustics — Relation between sound pressure levels of narrow bands of noise in a diffuse field and in a frontally-incident free field for equal loudness

*Acoustique — Relation entre les niveaux de pression acoustique de bandes étroites de bruit en champ diffus et en champ libre à incidence frontale pour des sonies égales*

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**Descriptors** : acoustics, auditory perception, sound pressure, loudness.

Price based on 2 pages

## FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up has the right to be represented on that Committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 43 has reviewed ISO Recommendation R 454 and found it technically suitable for transformation. International Standard ISO 454 therefore replaces ISO Recommendation R 454-1965 to which it is technically identical.

ISO Recommendation R 454 was approved by the Member Bodies of the following countries :

Australia	Finland	Netherlands
Austria	France	New Zealand
Belgium	Germany	Sweden
Brazil	Greece	Switzerland
Canada	Hungary	United Kingdom
Chile	India	U.S.A.
Colombia	Italy	U.S.S.R.
Czechoslovakia	Japan	Yugoslavia
Denmark	Korea, Rep. of	

No Member Body expressed disapproval of the Recommendation.

The Member Bodies of the following countries disapproved the transformation of ISO/R 454 into an International Standard :

Canada  
U.S.A.

# Acoustics – Relation between sound pressure levels of narrow bands of noise in a diffuse field and in a frontally-incident free field for equal loudness

Supplement to ISO/R 226, *Normal equal-loudness contours for pure tones and normal threshold of hearing under free-field listening conditions*

## 0 INTRODUCTION

Curves defining relations between frequencies characterizing sound and their sound pressure levels for the condition of constant loudness, i.e. equal-loudness contours, are involved in many aspects of subjective acoustics. They are fundamental to a proper understanding of the functioning of the human ear in the perception of loudness. They also have important practical applications, for example, in the development of methods of computing loudness from the physical properties of sounds.

Types of sounds and the manner in which they arrive at a listener may be varied. In addition to the basic equal-loudness contours for pure tones, as specified in ISO/R 226<sup>1)</sup>, it is desirable to establish equal-loudness contours for bands of noise in the conditions of free-field and random incidence.

This International Standard specifies the relationship between the sound pressure levels of narrow bands of noise in diffuse and frontally-incident free fields respectively, for equal loudness.

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies, for the frequency range 50 to 10 000 Hz, the difference (in decibels) between

sound pressure levels for equal loudness of narrow bands of noise in diffuse and frontally-incident free-field conditions respectively.

### Conditions of applicability

- a) The sound pressure level is measured in the absence of the listener.
- b) The listening is binaural.
- c) The listeners are otologically normal persons in the age group from 18 to 25 years.

NOTE – An “otologically normal subject” is understood to be a person in a normal state of health who is free from all signs or symptoms of ear disease and from wax in the ear canal.

- d) The sound is a narrow band of noise of less than critical bandwidth.

NOTE – For bands of noise not exceeding critical bandwidth, the equal-loudness contours for free-field conditions are approximately the same as those for pure tones, given in ISO/R 226. In practice, the use of one-third octave bands in place of critical bands (see Bibliography, item 5) does not introduce deviations of more than 1 dB.

1) ISO/R 226, *Normal equal-loudness contours for pure tones and normal threshold of hearing under free-field listening conditions*.