BRITISH STANDARD

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IEC 263:1982

Specification for

Scales and sizes for plotting frequency characteristics and polar diagrams

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Committees responsible for this British Standard

This British Standard was published under the direction of the Electronic Equipment Standards Committee EEL/-. Its preparation was entrusted to Technical Committee EEL/24 upon which the following bodies were represented:

British Radio and Electronic Equipment Manufacturers' Association
Department of Health and Social Security
Department of Industry (National Physical Laboratory)
Institution of Electronic and Radio Engineers
Post Office
Royal National Institute for the Deaf
Society of Hearing Aid Audiologists Limited

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Amendments issued since publication

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Contents

National foreword

This British Standard has been prepared under the direction of the Electronic Equipment Standards Committee. It is identical with IEC Publication 263:1982 "*Scales and sizes for plotting frequency characteristics and polar diagrams*" published by the International Electrotechnical Commission (IEC).

Terminology and conventions. The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards. Attention is drawn especially to the following.

In Figure A.3 the comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 6 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Introduction

In order that a proper impression may be gained from a graph in which a response is plotted as a level (in decibels) against frequency on a logarithmic scale, it is important that the proportions of the scales be standardized. Otherwise, a spectrum or response curve can be made to appear unduly flat or unduly steep by compression or expansion of one of the scales.

The ultimate interest is usually an output spectrum that results from the combination of an input spectrum with several individual response characteristics such as those of a microphone, amplifier, loudspeaker and perhaps a transmission loss. Such characteristics may similarly be combined for instruments such as hearing aids, recorders and vibration measuring apparatus. The contribution of each element to the final result is more readily understood if each characteristic is plotted to scales having a standard proportion.

For displaying response-frequency characteristics, different ranges and orders of accuracy are needed. Thus, a range of 10 dB may suffice for the response of a standard microphone, but a range of more than 60 dB may be required for a filter. Although these requirements emphasize the need for different scale proportions, the number of proportions should be kept at a minimum to facilitate comparisons.

If identical scale sizes are used, curves on translucent paper may be laid over one another for easy comparison. Although graphs for publication may be reduced to fit the printed page, the use of a standard proportion makes it feasible to compare graphs from different publications by direct superposition of suitable enlargements.

1 Scope

1.1 This standard specifies standard proportions for the scales for plotting frequency characteristics and polar diagrams.

1.2 This standard does not apply to audiograms.

2 Logarithmic frequency scales

For graphs in which a level (in decibels) is plotted against frequency on a logarithmic scale, the scale proportions shall be those for which the length for a 10 : 1 frequency ratio is equal to the length for a level difference of 10 dB, 25 dB or 50 dB on the ordinate scale.

3 Polar level diagrams

3.1 For polar plots in which a level, in decibels, is shown increasing outward along a radius on a linear scale, the maximum level should preferably be plotted on, or within 5 dB of, a reference circle whose radius corresponds to a difference in level of 50 dB. Alternatively, the maximum level should preferably be plotted on, or within 2.5 dB of, the reference circle whose radius corresponds to a difference in level of 25 dB. The tolerance limits on the radius of the reference circle correspond respectively to ± 0.5 dB and ± 0.25 dB. These requirements apply for whatever length is chosen to represent 1 dB.

3.2 For an absolute level, referred to a fixed reference quantity, when the radius of the reference circle corresponds to a difference in level of 50 dB, the level assigned to the reference circle shall be a multiple of 10 dB. When the radius corresponds to a difference in level of 25 dB, the level assigned to the reference circle shall be a multiple of 5 dB. The level represented by the reference circle should be within 5 dB (or 2.5 dB) of the maximum level to be plotted.

3.3 For a relative level, such as the difference between an absolute level at a stated distance from a transducer in a particular direction, and the absolute level at the stated distance in a reference direction, the relative level assigned to the reference circle shall be 0 dB and the angle assigned to the reference direction shall be 0°.

Appendix A Examples of the requirements specified in this standard

Examples of original plots with the three scale proportions specified in this standard are shown respectively in Figure A.1 (page 3), Figure A.2 and Figure A.3 (page 4). The examples are drawn with real data, but are not intended to restrict the plotting of a characteristic to any particular one of the scale proportions illustrated. One dB is represented respectively by the convenient sizes of 1 mm, 2 mm and 5 mm, corresponding to 50 dB, 25 dB and 10 dB equal in length to the specified size of 50 mm for the 10 : 1 frequency ratio on the logarithmic scale. It should be noted that the vertical rulings on Figure A.1 and Figure A.3 are equally spaced, with 5 mm representing one-third octave, thus allowing the use of linear graph paper.

— Figure A.4 (page 5), is an example of a polar diagram according to this standard, showing the sound level at a distance of 150 m from an aircraft on the ground.

One decibel is represented by 2 mm, and the radius of the reference circle is defined by a level difference of 50 dB; hence the radius of the reference circle is 100 mm. The maximum sound level to be plotted is 118 dB, and the multiple of 10 dB within 5 dB of this maximum level is 120 dB. Thus the sound level represented by the reference circle is 120 dB.

— Figure A.5 (page 6), is an example of a polar diagram according to this standard, showing the directional response of a radial horn loudspeaker at 8 000 Hz, relative to the response on the axis at the given distance from the loudspeaker. One decibel is represented by 4 mm, and the radius of the reference circle is defined by a level difference of 25 dB; hence the radius of the reference circle is 100 mm. As usual, the reference circle represents 0 dB relative level.

The 200 mm diameter of the reference circle is such that a fully circular directivity pattern is just small enough to be reproduced on paper of A4 size. Any additional plotting space outside the reference circle, such as at the top and bottom of these examples, is available for levels that exceed somewhat the level represented by the reference circle.

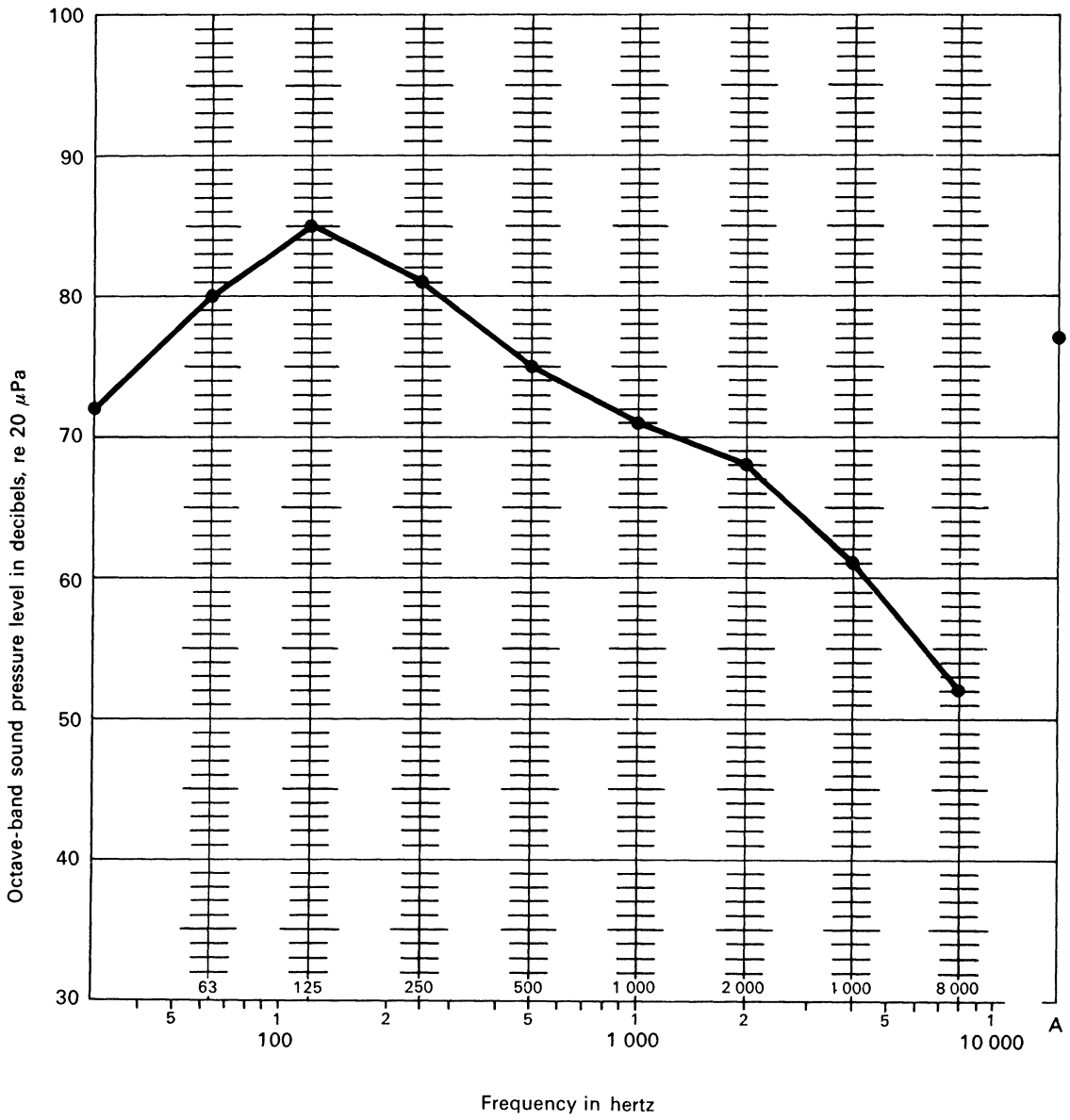

Figure A.1 — Example of ventilating noise spectrum with a scale proportion such that the length of the abscissa corresponding to a frequency ratio of 10 : 1 is equal to the length of the ordinate corresponding to 25 dB

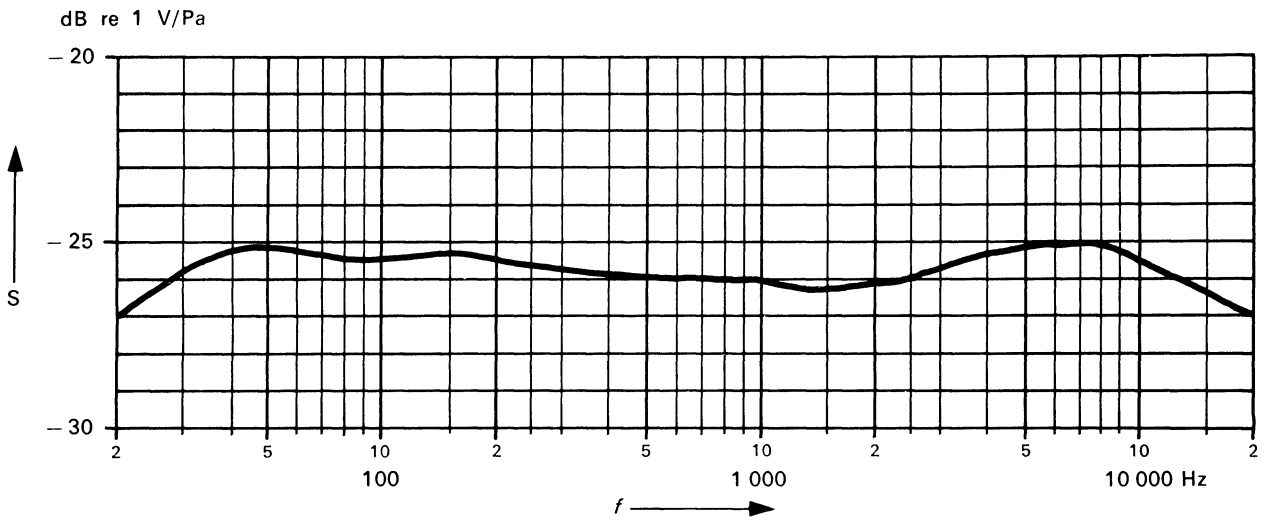

Figure A.2 — Example of a microphone calibration curve showing sensitivity level S as a function of frequency *f*, with a scale proportion of 10 dB for a frequency ratio 10 : 1

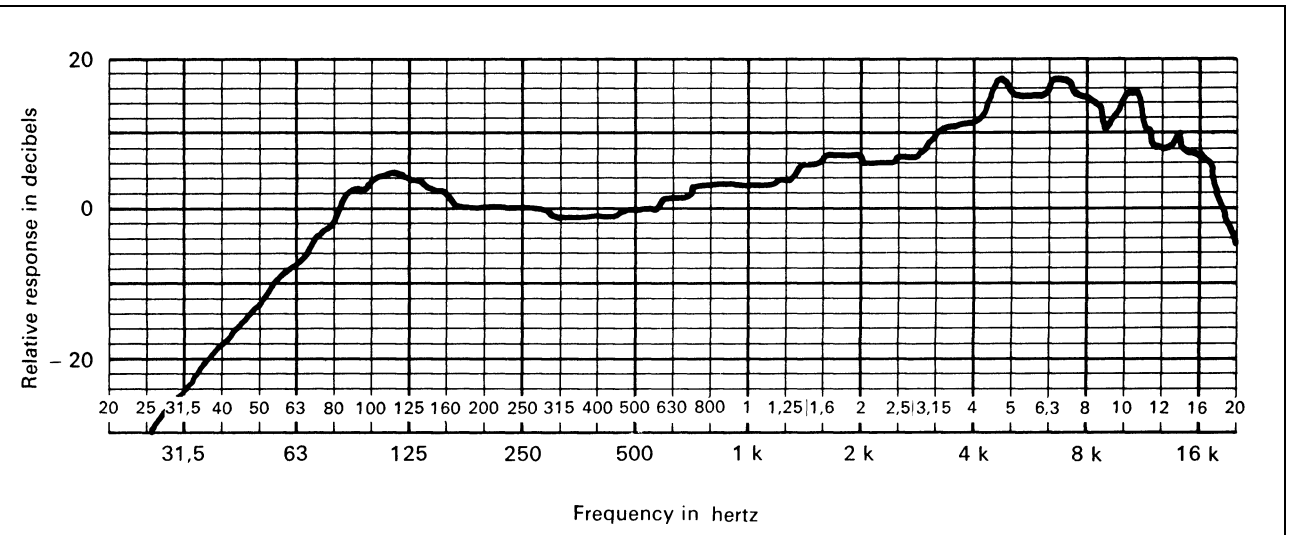

Figure A.3 — Example of loudspeaker response with a scale proportion of 50 dB for a frequency ratio 10 : 1

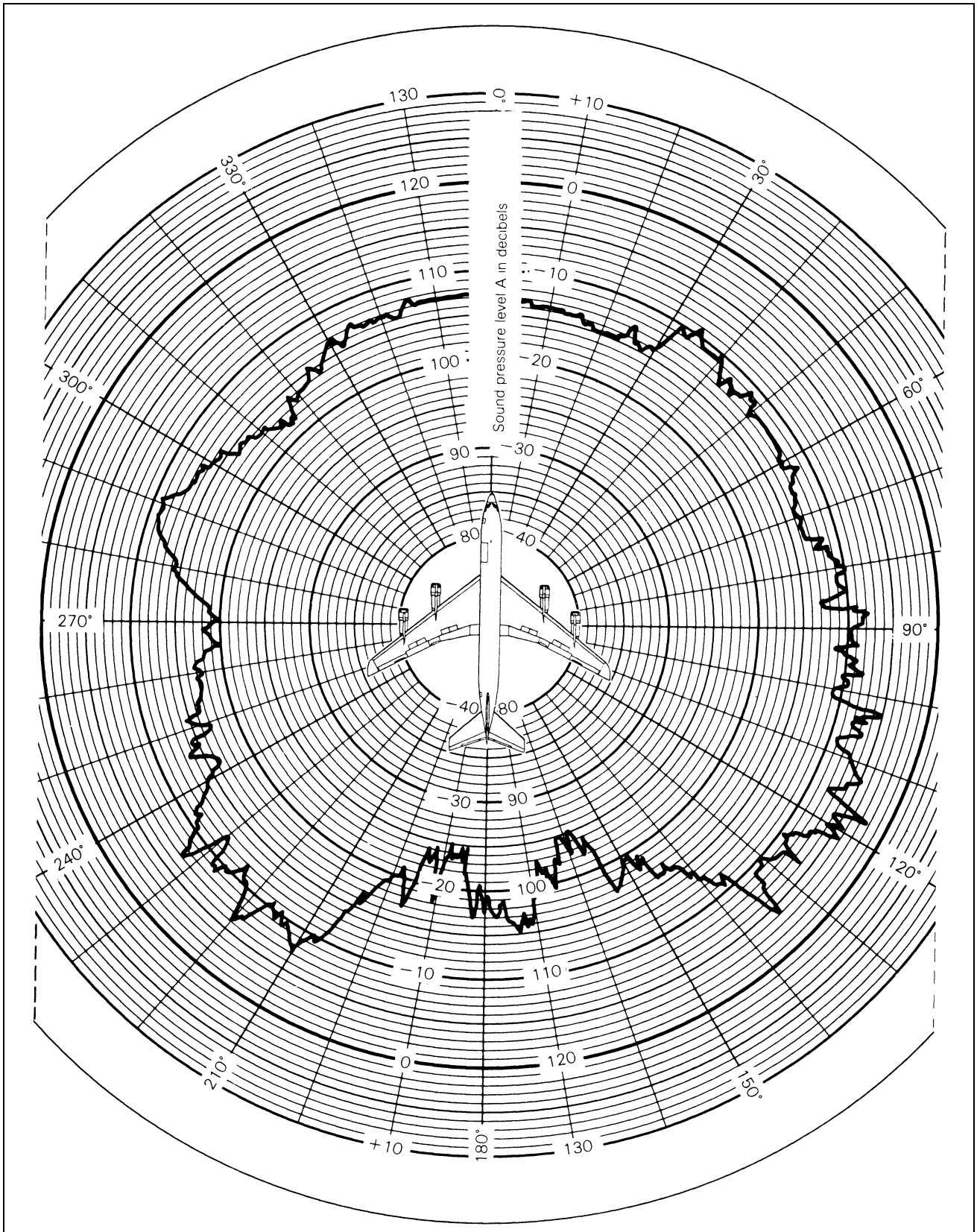

Figure A.4 — Example of a polar diagram with a reference circle radius corresponding to 50 dB showing sound level at a distance of 150 m from an aircraft

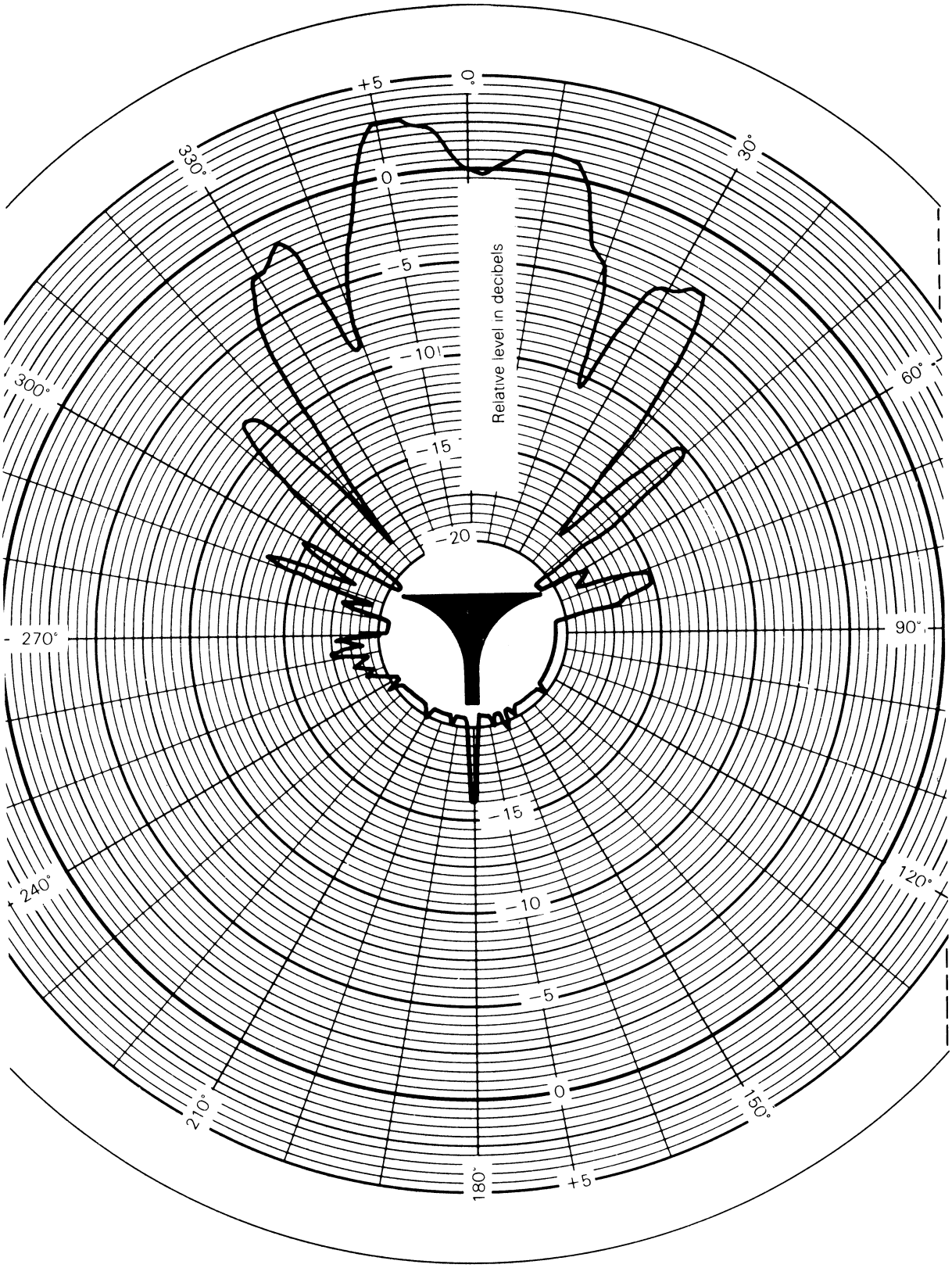

Figure A.5 — Example of a polar diagram with a reference circle radius corresponding to 25 dB showing the directional response of a radial horn loudspeaker at 8 000 Hz

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