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Ultrasonics – Focusing transducers – Definitions and measurement methods for the transmitted fields

Ultrasons – Transducteurs focaliseurs – Définitions et méthodes de mesure des champs transmis

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ULTRASONICS – FOCUSING TRANSDUCERS – DEFINITIONS AND MEASUREMENT METHODS FOR THE TRANSMITTED FIELDS

FOREWORD

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International Standard IEC 61828 has been prepared by IEC technical committee 87: Ultrasonics.

The text of this standard is based on the following documents:

FDIS	Report on voting
87/196/FDIS	87/204/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A, B and C are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

Focusing transducers are essential in medical applications for obtaining high-resolution images, Doppler and flow data and for concentrating ultrasonic energy at desired sites for therapy. Present terminology for focusing transducers is inadequate for communicating precisely the characteristics of the focused fields of the wide variety of transducers and transducer array types and focusing means in common usage.

This International Standard provides specific definitions appropriate for describing the focused field from a theoretical viewpoint for transducers with known characteristics intended by design. Other specific definitions included in this standard, based on measurement methods, provide a means of determining focusing properties, if any, of a transducer of unknown field characteristics. The measurement method and definitions provide criteria for determining if the transducer is focusing, as well as a means of describing the focusing properties of the field. Beam axis alignment methods are given for focusing transducers.

ULTRASONICS – FOCUSING TRANSDUCERS – DEFINITIONS AND MEASUREMENT METHODS FOR THE TRANSMITTED FIELDS

1 Scope

This International Standard

- provides definitions for the transmitted field characteristics of focusing transducers for applications in medical ultrasound;
- relates these definitions to theoretical descriptions, design, and measurement of the transmitted fields of focusing transducers;
- gives measurement methods for obtaining defined characteristics of focusing transducers;
- specifies beam axis alignment methods appropriate for focusing transducers.

This International Standard relates to focusing ultrasonic transducers operating in the frequency range appropriate to medical ultrasound (0,5 MHz to 40 MHz) for both therapeutic and diagnostic applications. It shows how the characteristics of the transmitted field of transducers may be described from the point of view of design, as well as measured by someone with no prior knowledge of the construction details of a particular device. The radiated ultrasound field for a specified excitation is measured by a hydrophone in either a standard test medium (for example, water) or in a given medium. The standard applies only to media where the field behaviour is essentially like that in a fluid (i.e. where the influence of shear waves and elastic anisotropy is small), including soft tissues and tissue-mimicking gels. Any aspects of the field that affect their theoretical description or are important in design are also included. These definitions would have use in scientific communications, system design and description of the performance and safety of systems using these devices.

This standard incorporates definitions from other related standards[1] where possible, and supplies new, more specific terminology, both for defining focusing characteristics and for providing a basis for measurement of these characteristics.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

IEC 60050(801):1994, *International Electrotechnical Vocabulary (IEV) – Chapter 801: Acoustics and electroacoustics*

IEC 61102:1991, *Measurement and characterization of ultrasonic fields using hydrophones in the frequency range 0,5 MHz to 15 MHz*

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[1] Specifically, IEC 61102 and IEC 61157 (see clause 2).

IEC 61157:1992, *Requirements for the declaration of the acoustic output of medical diagnostic ultrasonic equipment*

IEC 61689:1996, *Ultrasonics – Physiotherapy systems – Performance requirements and methods of measurement in the frequency range 0,5 MHz to 5 MHz*