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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 7966-2022

Acoustics - Ultrasonic power measurement - Radiation force balances and the requirements

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foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1.Structure and Drafting Rules of Standardization Documents"

drafted.

This document replaces GB/T 7966-2009 "Acoustic ultrasonic power measurement radiation force balance method and performance requirements", and

Compared with GB/T 7966-2009, in addition to structural adjustment and editorial changes, the main technical changes are as follows.

--- Added rectangular transducers and their associated symbols (see Chapter 4, 5.2.3, A.5.3.2, B.5);

--- More attention has been paid to the case of focusing transducers, and the impact analysis of scanning has been added (see 5.2.3, 7.15, A.5.3.3, A.7.15, B.5);

--- Increased the grading method of the radiation force balance calibration device (see 5.10);

--- Modified the basic formula in Appendix B [see formula (B.5) ~ formula (B.11)], and added "buoyancy change method" in Appendix C (see formula (B.5) ~ formula (B.11)]

IEC 62555.2013).

This document is equivalent to IEC 61161.2013 "Ultrasonic Power Measurement Radiation Force Balance Method and Performance Requirements".

The following editorial changes have been made to this document.

--- Modified the standard name;

--- Adjusted the order of the following fractions of formula (A.1) and formula (A.2);

--- Replace the example value of gravity acceleration g in Central Europe in A.5.4 with

Beijing's;

--- The two parts of formula (B.6) are equivalently merged, and function (gamma, theta) is directly replaced by the specific formula.

Please note that some content of this document may be patented. The issuing agency of this document assumes no responsibility for identifying patents.

Introduction

There are many methods for measuring the total radiated power of ultrasonic transducers (see References [1], [2], [3] and Appendix C). Purpose of this document

is an established standard method for measuring ultrasonic power in liquids using a gravimetric balance for radiated force in the low megahertz frequency range

Measurement. The biggest advantage of radiation force measurement is that it does not need to integrate the sound field data on the cross section of the radiation beam, and the total radiation power can be directly obtained.

rate value. This document identifies sources of measurement error and describes a systematic step-by-step procedure for assessing the total uncertainty.

precautions to be taken and uncertainties to be considered when measuring.

The basic safety requirements for ultrasound physiotherapy devices are identified in IEC 60601-2-5 and refer to IEC 61689, which specifies the measurement of ultrasound power

The uncertainty at the 95% confidence level should be better than 15%. Considering that the accuracy of this standard is reduced in practical applications and other reasons, it is necessary to establish

Standard measurement methods with an established uncertainty better than 7%. Published requirements for ultrasonic diagnostic equipment, including requirements for sound power, have been

It is specified in IEC standards such as IEC 61157.

The precision, accuracy, and repeatability of sound power measurements by the radiation force balance method used in this document are affected by practical problems. do

As a guide for users, Appendix A provides additional information in the same order as the main text of this document.

Acoustic Ultrasound Power Measurement

Radiation force balance method and its requirements

1 Scope

This document specifies a method for the determination of the total radiated sound power of an ultrasonic transducer based on the use of a radiation force balance;

Field and the principle of using radiation force balance measurement; clarified the limitations of radiation force method in the case of cavitation and temperature rise; clarified radiation force method

Quantitative usage limitations of the force method in the case of diverging and focused beams; provides methods for estimating the acoustic power of diverging and focused beams using the radiation force method

Information; provides information for evaluating the uncertainty of all measurements.

This document applies to.

a) Using a radiation force balance, the measurement of ultrasonic power within the frequency range of 0.5MHz~25MHz does not exceed 1W;

b) Using a radiation force balance, the measurement of ultrasonic power within the frequency range of 0.75MHz~5MHz does not exceed 20W;

c) Measurement of the total ultrasonic power of parallel, divergent and focused ultrasonic fields;

d) Measurements using gravity or force feedback radiation force balances.

(see A.1).

Note 1.The focused beam converges in the front section of the focal point and diverges after the focal point.

Note 2.In the high-intensity therapeutic ultrasound (HITU) range, that is, the measurement of ultrasonic power exceeding 1W or exceeding 20W, respectively, is handled by IEC 62555.

2 Normative references

There are no normative references in this document.

3 Terms and Definitions

The following terms and definitions apply to this document.

3.1

acousticstreaming

The integral motion of the fluid caused by the sound field.

3.2

freefield

A sound field with negligible boundary effects in an isotropic homogeneous medium.

[Source. GB/T 2900.86-2009, definition 801-23-28, with modifications. does not contain the word "sound"]

3.3

output power outputpower

The time-averaged ultrasonic power emitted by an ultrasonic transducer into an approximate free field under specified conditions in a specified medium (preferably water).

Note. The unit of output power is watts (W).