

**Korea Research Institute of Standards and Science (KRISS)
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Sang Joon Suh

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Development and Improvement of National Standards
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• Measurement of Spatial Distribution of the Acoustic Pressure Field Radiated from the Ultrasonic Transducers Using a Miniature Hydrophones: Planar Scanning Method

Currently, ultrasounds are widely used to industrial, military, and medical purposes. For those fields, the performance of the ultrasonic source transducer is important. The acoustical properties of the source transducer to be used as performance parameters can be listed as: 1 directional property, 2 symmetry of field, 3 near and far field zones, 4 focusing or diverging property, 5 radiation efficiency, 6 spatial distribution of the pressure amplitude radiated from the source transducer.

The measurement of item 6 'spatial distribution of the pressure amplitude radiated from the source transducer' can be achieved through the planar scanning method using a calibrated miniature hydrophone. The IEC standard 1102 specifies the measurement of item 6. Because the radiation efficiency (or radiation conductance) is defined by the radiated ultrasonic power (acoustic power of ultrasound) per the square of supplied rms voltage of the electric signal, the measurement of rms voltage and the integration of item 6 lead to item 5 'radiation efficiency'. The items form 1 to 4 can be obtained by analyzing the spatial-distribution graph.

Moreover, the planar scanning method is also available to calibrate a miniature hydrophone by combining the radiation force balance method. The IEC standard 1101 specifies this. The planar scanning system of us is composed of a tri-axial translator whose scanning range is 400 mm × 400 mm × 800 mm (WHL), control unit and interface, and needle type miniature hydrophones whose diameters are 1 mm, 0.5 mm, 0.2 mm, and 0.025 mm (PVDF, Precision Acoustics Co.). The possible frequency range for the measurement is from 1 to 15 MHz.

• Free-Field Reciprocity Calibration System

The small anechoic chamber with dimensions of 2.3 m(D) x 2.2 m(W) x 2.4 m(H) and with cut-off frequency of 340 Hz was prepared for the free-field reciprocity calibration of laboratory standard microphones. The distance between the two microphones is accurately adjusted by the precision microphone positioning system which is controlled by the desk top computer. The time delay spectrometry (TDS) is used to remove the influence of reflected wave from the walls of anechoic chamber. The other methods are under consideration to compare the calibration results. The system is under final test for the validation and will be used for CCAUV.A-K4 (free-field sound calibration in air) in next year.

• Replacement of Absorbing Wedge in Anechoic Chamber

The large anechoic chamber which was built in 1980 had the glass wool absorbing wedges. The new absorbing wedges which are made of polyester urethane foam are

replaced. The dimensions of the absorbing wedges are 1.2 m in length and 30 x 30 cm² base surface with 20 cm shoulder and 25 mm tip off. The density of foam is 32 kg/m³ and the color is beige. The dimensions of the free space are 4.5 m(W) x 7 m(L) x 4.5 m(H). The chamber will be used for the various acoustic researches as well as free-field response calibration of sound level meters.

● Peer Review

KRISS had been approved by Korean Foundation for Quality (KFQ) and the International Certification Network (IQNET) to ISO 9001:1994. The scope of certification covers services of calibration, testing, and certification of reference materials in the fields of physical metrology, electromagnetic metrology, optical metrology, chemical metrology, materials evaluation, industrial measurement technology, and vacuum technology. Originally approved as of February 14, 2001, it remains valid through December 14, 2003.

In accordance with the provisions set by the global MRA initiated by the CIPM, KRISS has been working for refining its quality management system, while actively participating in the key comparisons for securing the equivalence of the national measurement standards.

To meet the requirements for the global MRA, KRISS has been going through a series of peer reviews since September 2001. The peer review was done to evaluate the calibration and testing services of AUV against the technical requirements of the ISO/IEC 17025 in July 1 to 4, 2002. The range of operation was taken as, but not limited to, the declaration of Calibration and Measurement Capabilities (CMC) to be submitted to Appendix C of the CIPM MRA. The reviewers are: Dr. Suzanne Thwaites (CSIRO, Australia), Mr. Wan Aziz Wan Salleh (SIRIM Berhad, Malaysia) for acoustics and ultrasound, and Dr. George S. K. Wong (NRC, Canada) for vibration.